Fishery Management Report No. 05-42

Kitoi Bay Hatchery Annual Management Plan, 2005

by

Steven Honnold

and

Andrew W. Aro

July 2005

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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July 2005

Kitoi Bay Hatchery operations are funded by Kodiak Regional Aquaculture Association (KRAA). In addition, all evaluations of hatchery salmon stocking programs are funded by KRAA.

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This document should be cited as:
Honnold, S. and A. W. Aro. 2005. Kitoi Bay hatchery annual management plan, 2005. Alaska Department of Fish and Game, Fishery Management Report No. 05-42, Anchorage.

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EXECUTIVE SUMMARY

New Projects for 2005: None

Cost Recovery: Conduct cost recovery fishery, with similar objectives as in 2004.

2005 Adult Salmon Runs, Stocking Plan, Egg-take Goals, and Fish Transport Permits (rounded to thousands):

Stocking	2005 Projected	2005 Stocking Plan		2005 Egg-take Goals				Fish Transport Permits			
Location (Broodstock	Enhanced Run	Releases	Brood Year	2005 Eggs	2006 Stocking	Brood Year	Lifestage	Number	Expiration	Max. Eggs	Max Juv.
Kitoi Bay pink (Big Kitoi Creek)	10,576,000	145,000,000	2004	175,000,000	145,000,000	2005	fry	01A-0102	30-Aug-06	215,000,000	182,000,000
Kitoi Bay chum (Big Kitoi Creek)	278,000	22,000,000	2004	25,000,000	22,000,000	2005	fry	01A-0103	31-Aug-06	25,000,000	22,000,000
Kitoi Bay coho (Big Kitoi Creek)	156,000	1,000,000	2003	1,300,000	1,000,000	2004	smolt	02A-0007	01-May-12	1,300,000	1,000,000
Jennifer Lake coho (Big Kitoi Creek)	1,500	200,000	2004	300,000	200,000	2005	fingerling	02A-0009	01-May-12	300,000	250,000
Ruth Lake coho (Big Kitoi Creek)	500	30,000	2004	60,000	30,000	2005	fingerling	02A-0011	01-May-12	60,000	30,000
Crescent Lake coho (Big Kitoi Creek)	3,000	165,000	2004	600,000	165,000	2005	fingerling	02A-0008	15-May-12	600,000	500,000
Katmai Lake coho (Big Kitoi Creek)	1,000	15,000	2004	40,000	15,000	2005	presmolt	02A-0010	01-May-12	40,000	30,000
Little Kitoi Lake sockeye (Saltery Lake)	9,000	380,000	74% - 2003; 26% - 2004	600,000	400,000	75% - 2004; 25% - 2005	presmolt	05A-0078	12-Jun-10	FTP 97A-0068 (expires 12/31/08) - 1,200,000	500,000

ABSTRACT

The Kitoi Bay Hatchery (KBH) is located on Afognak Island about 48 kilometers (30 miles) north of the city of Kodiak and is financed and operated by the Kodiak Regional Aquaculture Association. Currently, KBH incubates and rears a single stock of each of the following salmon species: pink *Oncorhynchus gorbuscha,* chum *O. keta*, coho *O. kisutch*, and sockeye *O. nerka* salmon. This management plan describes: 1) projected releases of juvenile salmon in 2005, 2) egg takes in 2005 and projected releases in 2006 and 2007, 3) salmon harvest management in 2005, 4) additional measures for wild stock protection in 2005, and 5) evaluation plans for 2005.

Approximately 145,000,000 pink salmon fry (Big Kitoi Creek stock) will be released in 2005. The 2005 adult return from 2004 fry releases into Kitoi Bay is expected to be about 10,576,000 pink salmon, of which over 10,200,000 will be available for harvest. About 335,000 adult broodstock will be used in 2005. Hatchery personnel will collect 175,000,000 pink salmon eggs in 2005, which will result in approximately 145,000,000 fry for release from the hatchery in 2006.

Kitoi Bay Hatchery plans to release 22,000,000 chum salmon fry (Big Kitoi Creek stock) into Kitoi Bay in 2005. Prior fry releases are expected to produce a return of about 278,000 adult chum salmon in 2005. About 30,000 adult chum salmon will be collected for broodstock in 2005. These fish will provide 25,000,000 eggs for a chum salmon release of 22,000,000 in 2006.

About 1,000,000 coho salmon smolt (BY 2003 Big Kitoi Creek stock) will be released into Big Kitoi Bay in 2005. A total of approximately 395,000 fingerlings will be released into Jennifer, Ruth, and Crescent Lakes and 15,000 presmolt will be released into Katmai Lake in 2005. Prior releases of juvenile coho salmon are expected to produce a return of about 162,000 adults in 2005. About 2,300,000 eggs will be collected in 2005, which are expected to produce about 395,000 fingerlings and 15,000 presmolt for release in 2006 and 1,000,000 coho salmon smolt for release in 2007.

In 2005 approximately 280,000 sockeye salmon presmolt (BY 2003 Saltery Lake stock) will be imprinted in net pens in Little Kitoi Lake (LKL) prior to non-volitional release into Little Kitoi Bay. In addition, 100,000 BY 2004 sockeye presmolt will be released into LKL in the fall of 2005. About 400,000 Saltery Lake alevin (BY 2004) currently at Kitoi Bay Hatchery will be imprinted in net pens in LKL prior non-volitional release into Little Kitoi Bay in the spring of 2006. Prior releases of this stock are expected to produce a return, in 2005, of about 9,000 adult sockeye salmon. Egg takes in 2005 will require about 600,000 eggs for future sockeye salmon releases (100,000 fall release in 2006 and 400,000 spring presmolt into net pens in LKL in the spring of 2007).

A cost recovery fishery, similar to the 2004 fishery (revenue goal of $500,000), will be executed at Kitoi Bay in 2005. The fishery will again target primarily pink salmon, but some chum and coho salmon will likely be caught incidentally.

Key words: Kitoi Bay Hatchery, Kodiak Regional Aquaculture Association, salmon, broodstock, stocking, fry, fingerling, presmolt, smolt, harvest management, cost recovery

INTRODUCTION

Kitoi Bay Hatchery (KBH) is located on Afognak Island (58° 11.04’ N lat., 152° 21.04’ W long.) on the west side of Izhut Bay approximately 48 km (30 miles) north of the city of Kodiak (Figure 1). The hatchery infrastructure was constructed in 1954 by the United States Department of the Interior, Fish and Wildlife Service (FWS), but was destroyed in the 1964 earthquake and then rebuilt by the Alaska Department of Fish and Game (ADF&G) in 1965. The hatchery was initially designed as a sockeye salmon *Oncorhynchus nerka* research facility; in 1976 the emphasis switched to pink salmon *O. gorbuscha* production. The present goal of the facility is to provide enhanced salmon fishing opportunities for the Kodiak Management Area (KMA) common property fisheries by increasing the returns of pink, chum *O. keta*, coho *O. kisutch*, and sockeye salmon primarily to the Kitoi Bay area (Figures 2 and 3). KBH was designed to increase salmon production for KMA commercial seine and set gillnet fisheries. Secondary user groups (in terms of the number of salmon harvested) of hatchery production

include subsistence and recreational fishers. KBH has the capacity to produce 170 million juveniles of all life stages (fry, fingerling, presmolt, and smolt). Funding for the hatchery was provided exclusively by ADF&G prior to fiscal year (FY) 1987, and was provided jointly by ADF&G and Kodiak Regional Aquaculture Association (KRAA) from FY 1987 to FY 1991. The hatchery has been fully funded by KRAA since FY 1992.

KBH is primarily a site-specific production facility where the majority of eggs are collected and incubated on-site and resultant juveniles of all life stages are reared and released from the hatchery. The majority of the returning adults are caught by Kodiak's commercial salmon net fishers in the Duck, Izhut, and Inner and Outer Kitoi Bay Sections of the Afognak District (Figures 2 and 3).

Big Kitoi Lake (BKL) supplies KBH with water through two deep and one shallow 35.6-cm (14-inch) diameter pipelines (Figure 4). The two deep pipelines extend 457 m (500 yards) and 732 m (800 yards) into BKL drawing water from depths of 15.2 m (50 feet) and 22.9 m (75 feet), respectively. These deep pipelines join just downstream of the dam and supply one pipeline extending to the hatchery with water ranging from 3.0 to 6.0°C. The shallow pipeline draws water from a depth of 5 feet, supplying water with temperatures ranging from 0.5° to 19°C. These pipelines connect to a manifold allowing the hatchery to control water temperatures in any part of the hatchery. Excess lake water drains from BKL through Big Kitoi Creek (BKC; Figure 4). BKC contains a barrier falls approximately 503 m (550 yards) upstream from salt water and 183 m (200 yards) downstream from BKL that prevents adult salmon from entering the lake. A weir is installed at the mouth of the creek and adjacent to KBH to facilitate pink salmon egg takes. Coho and chum salmon ascend a fish ladder at the weir and enter two raceways adjacent to the hatchery facility where they are utilized for egg takes.

Little Kitoi Lake (LKL) is located approximately 0.40 km (0.25 miles) north of KBH (Figure 4). LKL drains through concrete raceways and a fish pass system located at the lake outlet. All returning adult salmon must pass through this system before entering the lake. The raceways are designed to control movement of both returning adults and outmigrating smolt, enabling the single system to monitor escapement and outmigration simultaneously. While the adult and smolt systems are capable of operating at the same time, smolt can be injured traveling down the fish pass; therefore, the fish pass is shut down during the smolt outmigration. Smolt outmigrate through the smolt compound and into an 8-inch pipeline bypass adjacent to the adult fish pass. The fish pass and outmigration pipeline drain directly into Little Kitoi Bay.

The development of a pink salmon brood source began at the hatchery in 1976 using donor stock from a small run to BKC (Honnold and Aro 2003, 2004). Pink salmon are the only salmon species indigenous to BKC. The program expanded from an egg collection of approximately five million eggs in 1976 to 215 million eggs in 1989. Recent increases in green-egg to eyed-egg survival have lowered the pink salmon egg take requirement to a range of about 175 to 180 million eggs. All pink salmon eggs are collected from broodstock returning to BKC and are incubated at KBH. The resultant fry are reared in saltwater net pens adjacent to the hatchery for a period of three to eight weeks prior to release into Big Kitoi Bay.

A chum salmon broodstock program using Sturgeon River stock was initiated in 1980 (Honnold and Aro 2003, 2004). The first chum salmon egg take occurred at the hatchery in 1986. Thereafter, runs have been adequate to collect broodstock, but the hatchery production

goal of 25 million eggs (a 22 million fry release) was not consistently achieved until recent years (1999-2004). In 1991 an infectious hematopoietic necrosis virus (IHNV) outbreak resulted in a complete brood year (BY) failure (BY 1990). After the IHNV outbreak, ultraviolet (UV) light water disinfecting units were installed in the hatchery to sterilize all incubation water in an effort to prevent further disease outbreaks. The UV water treatment has been successful; no outbreaks of IHNV have occurred since it was installed. Chum salmon fry produced at the hatchery are reared in saltwater net pens adjacent to the hatchery for a period of six to twelve weeks prior to release into Big Kitoi Bay.

A coho salmon stocking project using Buskin Lake and LKL wild stocks was started at KBH in 1982 (Honnold and Aro 2003, 2004). The fry were released into a number Kodiak road system lakes and a portion were stocked into Buskin (Buskin Lake broodstock) and Little Kitoi Lakes (LKL broodstock). In 1990 coho salmon fingerlings were released into Kitoi Bay (wild LKL stock) to develop a hatchery broodstock returning to BKC and to increase the commercial harvest in the Kitoi Bay area. Since 1993 coho salmon runs have been adequate for hatchery egg takes and have provided enough eggs to reach production goals (about 2.0 million eggs). The majority of juvenile coho are released from the hatchery into Big Kitoi Bay at the smolt life stage; however, some juveniles are released as fingerlings into local lakes in the Kitoi Bay area (Jennifer and Ruth Lakes; Figure 4). Coho salmon fingerlings are also stocked into Crescent Lake (adjacent to Port Lions; Figure 5) and presmolt are stocked into Katmai Lake (adjacent to Ouzinkie village; Figure 1). These projects have created coho salmon subsistence fisheries for the villages of Port Lions and Ouzinkie. In addition, local school students assist with the stocking of Katmai Lake as part of their school curriculum.

KBH collected eggs from an age 0. component of the late-run Upper Station Lake sockeye salmon stock from 1988 through 1994 to develop a late-run sockeye salmon broodstock that would return to LKL (Figure 1; Hall et al. 1997; Honnold and Aro 2003, 2004). The age 0. fish spend only a few weeks rearing in Upper Station Lake (lower Olga Lake) before outmigrating to the ocean; thus, adults return sooner than those fish that rear for the typical 1 to 2 years in freshwater. Eggs from the age 0. sockeye salmon were incubated at KBH, reared in freshwater in raceways at the hatchery for about two weeks, and then transferred to net pens in Little Kitoi Bay. The net pens were protected from the open ocean by oil booms, which also slowed the flow of freshwater leaving LKL and provided a freshwater layer in the pens. This freshwater “lens” decreased the salinity in the net pens, allowing the age 0. smolt to acclimate to saltwater and imprint on LKL. Smolt were released after about a week of rearing in the net pens. The intent of this project was create a return of sockeye salmon to LKL that could be used as an egg source for Pillar Creek Hatchery (PCH) with resultant fry stocked into Spiridon Lake (Figure 1). Due to unsatisfactory survival from the age 0. releases, the project was modified in 1993 to include the stocking of age 0. presmolt (late fall releases) into LKL and age 1. smolt (late spring releases) into Little Kitoi Bay.

Previously, the stocking of LKL had been avoided because the lower depths of the lake contained a high concentration of hydrogen sulfide. This layer was the result of saltwater intrusion during the 1964 earthquake (Schrof et al. 2000). The layer acts like a “nutrient sink,” reducing the ability of the lake to support zooplankton, which is the primary food source for juvenile sockeye salmon. In 1995 an 8-inch pipeline was sunk into the lake and most of the hydrogen sulfide laden water was siphoned off. Although a small amount of hydrogen sulfide remained, the zooplankton levels immediately showed signs of improvement.

The enhancement strategies initially used to develop a LKL sockeye salmon run relied on the late-run Upper Station stock as a brood source; however, research by ADF&G concluded that the Saltery Lake sockeye salmon stock, as opposed to the late-run Upper Station sockeye salmon stock, was preferred for Spiridon Lake and LKL stocking (Clevenger et al. 1997; Honnold 1997). The earlier run timing of Saltery Lake sockeye salmon (about three weeks earlier than the late-run Upper Station sockeye stock) was expected to improve returns to Little Kitoi Lake and make broodstock collection easier. Additionally, the earlier run timing was expected to reduce the incidental harvest of Spiridon River pink and chum salmon stocks during the terminal fishery targeting returns to Spiridon Lake. Therefore, in 1997 Saltery Lake sockeye salmon were used for the LKL broodstock development program. BY 1997 smolt were released into LKL in the spring of 1999 with the expectation that they would outmigrate from the lake that year. About half of the expected number of smolt left the lake in 1999, indicating either poor survival or hold-over in the lake (Schrof and Honnold 2003).

The low smolt outmigration led to an experiment where half of the BY 1998 sockeye salmon were released in the fall (presmolt) of 1999 and the other half in the spring (smolt) of 2000 (McCullough et al. 2000). These releases were differentially fin clipped to determine their survival rates and outmigration timing. Results from the fin clipping studies suggested that the fall releases were the most successful, in terms of the number of smolt outmigrating from LKL (McCullough and Aro 2002). Juvenile sockeye salmon typically outmigrate from lakes after one year of rearing; however, poor rearing conditions (i.e., low zooplankton levels) prevent juvenile sockeye salmon from achieving the optimal size to tolerate saltwater, which results in fish remaining in lakes one or two additional years to acquire the necessary growth (Barnaby 1944; Krokhin 1957; Burgner 1964; Foerster 1968; Koenings et al. 1993). Thus, nutrients were added to LKL during 2000 to 2001 to improve zooplankton productivity (Schrof and Honnold 2003). In addition, fall presmolt releases were considered the best release strategy to lessen the impacts to the zooplankton community (Honnold and Aro 2003). These fish do not actively feed during the winter and based on the fin clipping results, we expected most presmolt to outmigrate the following spring prior to the zooplankton blooms in the lake. Presmolt stocking continued from 2000 through 2003 and appeared to reduce the incidence of smolt holding in LKL an extra year. Unfortunately, the fertilization program was discontinued after 2001 due to budget constraints and recent limnological data suggest that LKL continues to be a marginal environment for successfully rearing sockeye salmon (Schrof and Honnold 2003). These data indicate inadequate zooplankton production and a reduced capacity for the lake to support juvenile sockeye salmon releases. Consequently, releases have been reduced to match the theoretical carrying capacity of the LKL, which has reduced the number of outmigrating smolt.

In 2003, the broodstock development program was modified in response to the low number of outmigrants and poor zooplankton levels in LKL (Honnold and Aro 2003). A modest number (100,000) of presmolt were released (Saltery Lake broodstock) into LKL in the fall, as in the previous years, but a portion of the BY 2002 juveniles were reared at KBH through the winter of 2003/2004. These fish (about 190,000) were transferred into net pens in LKL during the second week of May 2004 at an average size of 18.9-g. After two and a half weeks of lake rearing, the smolt (25.7-g) were siphoned directly into Little Kitoi Bay. The release coincided with the peak of the resident sockeye smolt outmigration. This rearing and release strategy was very successful in its first year and a Permit Alteration Request (PAR) has been written to continue the rearing strategy and expand the project in 2005 and 2006. Once additional raceways at KBH are installed in 2005, 400,000 net pen and 40,000 LKL resident sockeye

smolt should be produced annually (assumed 40% smolt survival from 100,000 fall outstocking), which should provide adequate numbers of returning adults to satisfy the broodstock development goal.

This management plan describes: 1) projected releases of juvenile salmon in 2005, 2) egg takes in 2005 and projected releases in 2006 and 2007, 3) salmon (enhanced stocks) harvest management in 2005, 4) additional measures for wild stock protection in 2005, and 5) evaluation plans for 2005. Appendix A describes historical juvenile salmon releases from KBH, by species. Inseason assessments and project approvals by the KRAA, ADF&G, or the FWS may result in changes to this management plan in order to reach or maintain program objectives.

RELEASES IN 2005

PINK SALMON: BIG KITOI CREEK STOCK

KBH will release 145,000,000 0.7-g pink salmon fry in 2005 (Table 1). The fry will be volitionally released from the hatchery into saltwater net pens via pipelines, reared in saltwater for a period of three to eight weeks, and then released into Big Kitoi Bay (Figures 3 and 4).

About 6,600,000 adult pink salmon are expected to return to KBH in 2006 from this release based on a stocking-to-adult survival of 4.6% (Tables 1 and 2; average marine survival). The pink salmon run should begin in late July, peak in early August and end in late August (Figure 6). Most pink salmon returning to KBH will be harvested in the commercial salmon fishery in Izhut, Duck, and Kitoi Bay Sections (Figure 3).

CHUM SALMON: BIG KITOI CREEK STOCK

Approximately 22,000,000 2.5-g chum salmon fry will be released directly into Big Kitoi Bay in 2005 (Table 1; Figures 3 and 4). Approximately 19,000,000 fry, currently in Nopad incubators, will be non-volitionally released during the first three weeks of March. This will be the first year of the non-volitional outmigration system, which is intended to increase saltwater rearing duration, release size, and marine survival. Approximately 3,000,000 fry will be volitionally released from the hatchery via pipelines into saltwater net pens and reared for a period of 6 to 12 weeks.

Non-volitional outmigration is a common technique used throughout Alaska, primarily for chum salmon, but also used for pink salmon fry. The technique requires the use of a Nopad incubator, which is a stackable type of incubator that can be moved around to facilitate the non-volitional outmigration. Yolk sacs of the fry are sampled prior to outmigration to determine the percentage yolk sac to body weight. When that yolk sac to body weight ratio approaches 3 – 5%, the fry are ready to go to saltwater. At this point the incubators are lifted with an electric forklift, brought to a tank, submerged and emptied of all fry and incubator substrate. The water in the tank upwells over a bar grate and into another tank. The fry fall through the grate and flow by gravity to saltwater net pens. The substrate is separated from the fry by the bar grates and is removed for cleaning.

Non-volitional outmigration will allow over 90% of the chum fry to enter saltwater by the last week in March, which is approximately four weeks earlier than the previous volitional method allowed. This is made possible by recent improvements in the UV water manifold, which allows warmer shallow water to be used for chum salmon incubation. Egg development will be

accelerated and uniform so that all fry will be ready to enter saltwater at the same time. The extended rearing period is expected to increase chum salmon fry size by approximately 40% or more. The marine survival of chum salmon fry of this size is expected to range from 3.0 to 7.0% compared to the present average survival of 1.4% for KBH releases (Honnold and Aro 2004).

Applying a 4.0% stocking-to-adult survival, results in approximately 880,000 adults returning from the 2005 release beginning in 2007 and continuing through 2009 (Tables 1 and 2). About 660,000 age 0.3 chum salmon (three years ocean residence) are expected to return in 2008. Chum salmon runs into Kitoi Bay usually begin in early June, peak in mid June to early July and end in early August (Figure 6). Most chum salmon returning to KBH will be harvested in the commercial salmon fishery in the Duck, Izhut, and Kitoi Bay Sections (Figure 3).

COHO SALMON: BIG KITOI CREEK STOCK

Hatchery personnel will release 1,000,000 20.0-g age 1. coho salmon smolt (BY 2003, BKC broodstock) into Big Kitoi Bay in 2005 (Table 1; Figures 3 and 4). Initial imprinting will occur prior to transfer into saltwater, while smolt are still in the hatchery freshwater raceways. The smolt will be transferred from the hatchery via pipelines into saltwater net pens and reared for about four weeks to provide additional time for imprinting and adjusting to ocean salinity (osmoregulation). The saltwater net pens will be located in the vicinity of the BKC discharge (KBH water source), which is intended to provide further imprinting opportunities.

Approximately 160,000 adults (16.0% survival) are projected to return in 2006 as a result of the 2005 coho salmon smolt release (Tables 1 and 2).

Additional coho salmon (BY 2004 BKC broodstock) releases in 2005 in the Kitoi Bay area will include 200,000 0.7-g coho fingerlings into Lower Jennifer Lake and 30,000 0.7-g coho fingerlings into Ruth Lake (Table 3; Figure 4). About 2.0% of these releases, including 4,000 adults to Jennifer Lake and 600 adults to Ruth Lake, are expected to return in 2008 (Tables 2 and 3). Stream barriers (waterfalls) near tide water prevent adult salmon from entering either Jennifer or Ruth Lakes; therefore, all returning fish will be available for harvest.

Coho salmon runs into Kitoi Bay usually begin in early August, peak in mid to late August and end in early September (Figure 6). Most coho salmon returning to KBH should be harvested in the commercial salmon fishery in the Duck, Izhut, and Kitoi Bay Sections (Figure 3).

Remote releases (BY 2004 BKC broodstock) of 165,000 0.7-g coho fingerlings into Crescent Lake (Port Lions village area; Figure 5) and 15,000 7.5-g coho presmolt into Katmai Lake will also occur in 2005 (Ouzinkie village; Table 3; Figure 1).

Adult returns from these releases are projected to be 3,300 (2.0% survival) to Crescent Lake in 2008 and 750 (5.0% survival) to Katmai Lake in 2007 (Tables 2 and 3). The residents of each neighboring village primarily harvest these salmon during sport and subsistence fisheries. A portion of the Crescent Lake run may be available for commercial harvest in the Northwest Kodiak District (Figure 2) and the Settler Cove Special Harvest Area (SHA; Figure 5; 5 AAC 18.364, 5 AAC 40.085 (5)).

The coho salmon stocking capacity of Ruth, Jennifer, Crescent, and Katmai Lakes is based upon the surface area of each lake. Release numbers are adjusted, if needed, in response to zooplankton biomass trends at each lake. All juvenile coho salmon stocked into lakes are

transported to each site by floatplane using transfer tanks. The Katmai Lake release requires additional transport by four-wheelers equipped with small transfer tanks.

SOCKEYE SALMON: SALTERY LAKE STOCK

KBH will release 280,000 BY 2003 net pen reared sockeye salmon presmolt into LKL in May 2005 (Table 4). The BY 2003 juveniles will be transported to LKL by transfer tank, pumped into net pens, short-term reared (approximately two weeks) and imprinted and then siphoned out of the nets. The non-volitional outmigration from the net pens will occur during the peak outmigration of the resident sockeye smolt. In addition, about 100,000 BY 2004 presmolt will be released into LKL in October. This is the same release as in past years, with the exception of last year, when PCH released fish into LKL to assess airdrop mortality.

Approximately 49,000 adults are expected to return during 2006 through 2010 from the BY 2003 (42,000; 15.0% survival) and BY 2004 (7,000; 7.5% survival) releases (Tables 2 and 4). The majority of the returns should occur in 2007 and 2008 with the initial run beginning in late June, peaking in mid to late July and ending in mid August (Figure 7; Honnold 1997). The run timing is earlier than the Upper Station sockeye salmon stock which should make broodstock collection easier since the Saltery Lake stock should return after the chum salmon fishery and prior to the peak of the pink salmon fishery. This return timing is expected to reduce the harvest of these fish in the common property fishery and increase escapement into LKL.

SUMMARY OF 2005 RELEASES

In summary, releases in 2005 will include: 145,000,000 pink salmon fry (BY 2004), 22,000,000 chum salmon fry (BY 2004), 1,000,000 coho salmon smolt (BY 2003), 395,000 coho fingerlings (BY 2004), 15,000 coho presmolt (BY 2004), 280,000 sockeye salmon presmolt (BY 2003), and 100,000 sockeye salmon presmolt (BY 2004; Tables 1, 3, and 4).

EGG TAKES IN 2005 AND RELEASES IN 2006 AND 2007

PINK SALMON: BIG KITOI CREEK STOCK

About 335,000 adult pink salmon returning to KBH will be used for broodstock in 2005 (Tables 5 and 6). Approximately 175,000,000 eggs will be collected in 2005 to provide for the release of 145,000,000 0.7-g pink salmon fry into Big Kitoi Bay in 2006. The actual number released may be less depending on how many chum salmon eggs are collected and the egg to fry survival of both species. If the maximum chum salmon egg take occurs and results in about 25,000,000 eyed-eggs, incubation space will not be available for a maximum pink salmon egg take.

The 2006 release is expected to result in approximately 7,700,000 (5.3% survival) adult pink salmon returning to KBH in 2007 (Tables 2 and 6). The pink salmon run is expected to begin in late July, peak in early August and end in mid to late August (Figure 6).

CHUM SALMON: BIG KITOI CREEK STOCK

Approximately 30,000 chum salmon adults returning to KBH in 2005 will be used for broodstock to achieve an egg take goal of 25,000,000 eggs (Tables 5 and 6). We plan to release 22,000,000 2.5-g chum salmon fry into Big Kitoi Bay in 2006 using a non-volitional outmigration technique for 86% of the chum fry; the remaining 14% of the fry will outmigrate volitionally to saltwater net pens.

Applying an average of 4.0% stocking-to-adult return survival to the 2006 release, about 880,000 adult chum salmon are expected to return from 2008 through 2010 (Tables 2 and 6). The majority of the return is expected in 2009 (age 0.3 chum salmon - three years ocean residence). The run is expected to begin in early June, peak in mid June to early July and end in mid to late July (Figure 6).

COHO SALMON: BIG KITOI CREEK STOCK

Currently there are about 1,000,000 BY 2004 juvenile coho salmon rearing at KBH, which will be released as 20.0-g smolt into Big Kitoi Bay in 2006 (Tables 2 and 6). The 2006 smolt release should result in 160,000 adults returning in 2007. Approximately 6,000 of the 158,000 adults returning to KBH in 2005 will be used as broodstock for egg takes in 2005 (Table 5). A total of 2,300,000 eggs will be collected for five different releases (Tables 6 and 7). About 1,300,000 eggs will provide for the release of 1,000,000 20.0-g smolt from KBH in 2007 (Table 6). This release is expected to produce 160,000 (16.0% survival) adults returning in 2008. Approximately 360,000 eggs are needed for stocking at Jennifer (200,000 0.7-g fingerlings) and Ruth (30,000 0.7-g fingerlings) Lakes in 2006 (Table 7; Figure 4). These releases are expected to produce 4,600 (2.0% survival) adults returning in 2009 (Tables 2 and 7). About 640,000 eggs will also be collected for planned releases at Crescent (165,000 0.7-g fingerlings) and Katmai Lakes (15,000 7.5-g presmolt) in 2006 (Table 7; Figures 1 and 5). Approximately 3,300 (2.0% survival) adults should return in 2009 as a result of the Crescent Lake releases and 750 (5.0% survival) adults should return in 2008 as a result of the Katmai Lake releases (Tables 2 and 7).

Coho salmon runs should begin in early August, peak in mid to late August and end in early September (Figure 6). Most coho salmon returning to KBH and the Kitoi Bay area should be harvested in the commercial salmon fishery in the Duck, Izhut, and Kitoi Bay Sections (Figure 3). The residents of nearby villages primarily harvest salmon returning from the Crescent Lake (Port Lions village) and Katmai Lake (Ouzinkie village) stocking projects during sport and subsistence fisheries. A portion of the Crescent Lake run may be available for commercial harvest in the Northwest Kodiak District (Figure 2) and the Settler Cove SHA (Figure 5; 5 AAC 18.364, 5 AAC 40.085(5)).

SOCKEYE SALMON: SALTERY LAKE STOCK

KBH will release 400,000 25.0-g presmolt (BY 2004) into LKL in May 2006 (using net pens in LKL in a manner similar to the 2004 and 2005 releases), which should result in about 60,000 (15% survival) adults returning from 2007 through 2009 (Tables 2 and 8). Sockeye salmon eggs (672 broodstock; 600,000 eggs) will be collected from Saltery Lake or returning adults to LKL in 2005 to provide for the release of 100,000 9.0-g presmolt in October 2006 and 400,000 25.0-g presmolt in May 2007 into LKL (Table 8). About 67,000 adults (7.5% survival for fall presmolt; 15% survival for spring presmolt) are expected to return from 2008 through 2011 from these two releases (Tables 2 and 8). The returning adults are expected to have similar run timing as Saltery Lake sockeye salmon with the initial run beginning in late June, peaking in mid to late July and ending in mid August (Figure 7; Honnold 1997).

Sockeye salmon eggs were collected at Saltery Lake in 2004 and, based on the low sockeye forecast, an egg take at LKL is not expected to occur in 2005. LKL sockeye escapement will depend upon the actual run strength and the incidental harvest during directed fisheries on chum and pink salmon. Previous broodstock collection efforts at LKL resulted in about a 50%

capture rate when seining. Thus, a minimum escapement of about 8,200 sockeye salmon (double the 4,116 broodstock needed for KBH and PCH combined; Table 5) will be necessary to reach broodstock collection goals. The decision to collect broodstock at LKL will be made by the middle of August as determined by escapement levels. PCH personnel will collect broodstock and conduct an egg take at Saltery Lake if sockeye salmon escapement levels preclude broodstock collection at LKL in 2005 (Table 5; Honnold and Byrne *in press*)

SUMMARY OF EGG-TAKE GOALS IN 2005 AND RELEASES IN 2006 AND 2007

In summary, egg-take goals in 2005 are: 175,000,000 pink salmon eggs (335,000 broodstock), 25,000,000 chum salmon eggs (30,000 broodstock), 2,300,000 coho salmon eggs (6,000 broodstock), and 600,000 sockeye salmon eggs (700 broodstock; Tables 5-8). Releases planned for 2006 include: 145,000,000 pink salmon fry (BY 2005), 22,000,000 chum salmon fry (BY 2005), 1,000,000 coho salmon smolt (BY 2004), 395,000 coho fingerlings (BY 2005), 15,000 coho presmolt (BY 2005), and 400,000 sockeye salmon presmolt (300,000 BY 2004 and 100,000 BY 2005; Tables 5-8). An additional 1,000,000 coho salmon smolt (BY 2005) and 400,000 sockeye salmon presmolt (BY 2005) will be released in 2007.

SALMON HARVEST MANAGEMENT

ADULT SALMON FORECASTS FOR 2005

Approximately 10,576,000 pink salmon, 278,000 chum salmon, and 158,000 coho salmon (includes about 2,000 returning to Jennifer and Ruth Lakes) are expected to return to Kitoi Bay in 2005 as a result of previous releases of juvenile salmon from KBH (Table 5). Of these returns, we expect about 10,200,000 pink salmon, 246,000 chum salmon, and 152,000 coho salmon will be available for harvest. About 9,000 sockeye salmon are forecast to return to LKL in 2005.

KITOI BAY

The Kitoi Bay harvest strategy, as described in the Eastside Afognak Management Plan (5 AAC 18.365), is designed to increase fishing opportunities for the commercial salmon net fishery in the Duck, Izhut, and Kitoi Bays Sections (Figure 3) while providing for adequate broodstock to KBH. Inseason management of KBH salmon runs is complicated because of overlapping run timing between species and the broodstock priorities (Figure 6). Therefore, inseason adjustments to fishing periods in any or all management units may be necessary. These adjustments may occur more frequently in the Kitoi Bay Sections (Kitoi Bay SHA) and less frequently in the Duck Bay Section. During the broodstock collection periods, the burden of achieving adequate broodstock while maintaining high quality harvests on hatchery bound returns will be shared by the Kodiak Salmon Area Management Biologist and the Kitoi Bay Hatchery Manager.

The Board of Directors of KRAA have determined that the corpus, which had sustained the organization since 1989, is not sufficient to continue the long-term operation of Kitoi Bay Hatchery. Thus, KRAA seeks to derive funds from cost recovery fisheries to supplement hatchery operations. Cost recovery fisheries occurred in the Kitoi Bay Section in 1987, 1988, 1989, 2003, 2004, and will continue in 2005. As in 2004, the revenue goal will be $500,000 and the cost recovery fishery will focus on pink salmon (Honnold and Aro 2004). Vessels will again be contracted to catch and deliver the fish to processors having bids approved by the KRAA Board of Directors. Contract vessels may use atypical purse seine gear in the Kitoi Bay

SHA upon approval of ADF&G. Kitoi Bay SHA has been established (5 AAC 40.085(1)) as the Inner and Outer Kitoi Bay Section or all waters of Kitoi Bay west of line from 58° 09.50'N.lat., 152° 18.70'W.long. (Brennan et al. 2002, 2003, 2004; Figure 4).

Pink Salmon

Pink salmon produced at KBH are harvested in commercial purse seine fisheries in the Duck, Izhut, and Kitoi Bays Sections (Figures 3 and 4). Natural stocks of pink salmon destined for the west side of Kodiak Island and other Afognak Island systems may also contribute to the harvest. The pink salmon return begins in mid July, peaks in early to mid August, and ends in late August to early September (Figure 6). The initial fishery opening for pink salmon is expected in late July and is designed to harvest excess males, which arrive during the early portion of the run (Brennan et al. 2005). Broodstock will be collected throughout the duration of the run once it is composed of at least 60% female fish. Spawning pairs will be randomly selected during the egg takes to maximize genetic variability. In order to harvest pink salmon in excess of the hatchery broodstock needs (335,000 adults; Table 5), additional openings may occur.

Depending on run strength and timing, the Inner and Outer Kitoi, Izhut, and Duck Bay Sections may close to commercial salmon fishing from July 20 through September 5 to allow for pink salmon broodstock collection and cost recovery fisheries (Brennan et al. 2005; Figures 3 and 6). The cost recovery operations will most likely occur between August 1 and August 18. The common property fishery will remain open during the beginning of the pink return to assess run timing and strength before the cost recovery fishery will open. This is intended to maximize common property fishing opportunities at the beginning and end of the run and result in a condensed and efficient cost recovery fishery. Most pink salmon broodstock is collected by mid August. Once the pink salmon broodstock is collected and contained behind the barrier net enclosure, additional commercial fishing time may be allowed inside Kitoi Bay SHA depending on the progress of the cost recovery fishery (Figure 4). Fishing periods are coordinated between the Kitoi Bay Hatchery Manager and the Kodiak Area Management Biologist to ensure adequate broodstock, while maintaining an orderly cost recovery and commercial fishery. Escapement goals have not been formally established for Big Kitoi Creek; however, pink salmon escapement is monitored by KBH staff and about 15,000 pink salmon annually spawn in the creek (Table 5).

Chum Salmon

Chum salmon produced at KBH are taken in commercial purse seine fisheries in the Izhut, Duck, and Kitoi Bay Sections (Figure 3). The chum salmon run begins in early June, peaks in late June to early July, and ends in early August (Figure 6). The initial chum salmon commercial opening in the Duck, Izhut, and Kitoi Bays Sections will occur on June 5 in 2005 (Brennan et al. 2005). In order to harvest adults in excess of hatchery broodstock needs, additional openings in these sections may occur as run strength is determined. Most of the chum salmon needed for broodstock (30,000 adults; Table 5) are expected to be in the Inner Kitoi Bay Section by mid July (Figures 3 and 4). Broodstock are retained by a barrier net enclosure in Big Kitoi Bay (Figure 4). Once all chum salmon broodstock are contained behind the barrier net, additional commercial fishing time may occur in the Kitoi Bay SHA. The chum salmon egg take is expected to occur from early July through early August.

The Hatchery Manager and the Kodiak Area Management Biologist will coordinate openings in the Duck, Izhut, and Kitoi Bay Sections to minimize the harvest of chum salmon during the late July pink salmon fisheries. Escapement goals have not been formally established for Big Kitoi Creek; however, chum salmon escapement is monitored by KBH staff and about 2,000 chum salmon annually spawn in the creek (Table 5).

Coho Salmon

Coho salmon produced at KBH are harvested in commercial purse and beach seine fisheries and contribute to the catch in the Duck, Izhut, and Kitoi Bay Sections (Figure 3). The coho salmon run is expected to start in late July, peak in late August, and continue through the beginning of September (Figure 6). The majority of the coho will be harvested incidental to the pink salmon fishery in the Kitoi Bay area as well as in directed coho fisheries in late August and early September. Hatchery broodstock (6,000 adults; Table 5) will be collected throughout the coho salmon run. In the past, a specific commercial fishing closure has not been necessary to ensure adequate broodstock. The run strength in 2005 is estimated to be substantially larger than broodstock requirements; therefore, specific commercial fishing closures are not expected to occur (Brennan et al. 2005). Coho salmon broodstock are incidentally collected during the pink broodstock collection and after the commercial fisheries are generally over and do not require the use of the barrier net.

There are three distinct areas where fishing is either prohibited year-round or restricted between August 15 and September 30 (Figures 3 and 4; 5 AAC 18.350; 5 AAC 64.022(b)). These closed waters areas are intended to improve broodstock collection efforts near the hatchery and are used as a precautionary measure to resolve potential conflicts between hatchery broodstock needs and subsistence and recreational fisheries.

Coho salmon returning to Jennifer and Ruth Lakes will also be harvested during commercial fisheries in Duck, Izhut, and Kitoi Bay Sections (Figure 3). All of the coho salmon bound for these lakes will be available for harvest; brood fish are not required at Jennifer or Ruth Lakes since they are a part of a remote release program from KBH. Jennifer and Ruth Lakes have barrier falls that prevent salmon escapement into the lakes. Fish that are not harvested at Jennifer and Ruth Lakes have access to the lower portion of the outlet streams, so they are not expected to stray.

Coho salmon will be able to enter LKL beginning the first week of September to provide escapement (approximately 500 salmon; Table 5) and to prevent straying. Although the coho salmon peak run timing is later than the pink salmon peak, most of the coho will be harvested during fisheries targeting pink salmon.

Sockeye Salmon

The sockeye salmon run should begin in late June and continue through mid August with the peak occurring during the first two weeks of July (Figure 7). The 2005 run (Saltery Lake stock) is forecast to be similar to the 2004 run and most likely will not provide an adequate adult return to warrant broodstock collection at LKL (Table 5). Closures inside the Kitoi Bay SHA may occur to allow or protect LKL bound sockeye (Brennan et al. 2005).

CRESCENT LAKE

Coho Salmon

The purpose of the Crescent Lake coho salmon stocking project is to provide enhanced coho salmon for harvest as they return to Crescent Lake (Figure 5; 5 AAC 18.364). Most of the 2005 coho salmon run will be harvested in the local sport and subsistence fishery; however, a portion of the run may be available for commercial harvest. The commercial harvest of Crescent Lake coho salmon is expected to occur during normal fishing periods targeting coho salmon in the Northwest Kodiak District (Figure 2). Special openings are not expected to occur within the Settler Cove SHA (Figure 5; 5 AAC 40.085). Natural barriers prevent salmon access to Crescent Lake, so all returning coho salmon will be available for harvest. Fish that congregate in the outlet stream are prevented from straying since the villagers of Port Lions utilize the entire escapement for subsistence purposes. Harvest information will be monitored via the ADF&G subsistence permit and commercial fish ticket programs.

KATMAI LAKE

Coho Salmon

The purpose of the Katmai Lake coho salmon stocking project is to provide adult returns for harvest by sport and subsistence fishers in the vicinity of Ouzinkie Village (Figure 1). This project is also intended to provide students in Ouzinkie Village with a community and educational project assisting in the release of the presmolt. Most coho salmon returning to Katmai Lake will be harvested in the local sport and subsistence fishery. Some may also be harvested in commercial fisheries in the Northwest Kodiak District (Figure 2). Natural barriers prevent salmon access to Katmai Lake, so all returning coho salmon will be available for harvest (Table 5). Fish that congregate in the outlet stream are prevented from straying since the villagers of Ouzinkie utilize the entire escapement for subsistence purposes. Harvest information will be monitored through subsistence permit and commercial fish ticket programs.

ADDITIONAL MEASURES FOR WILDSTOCK PROTECTION

GENETICS POLICY

The ADF&G Genetics policy is designed to assure that stocking projects do not negatively impact the genetic integrity of wild stocks (McGee 1995). The policy addresses three primary areas: 1) stock transport, 2) protection of wild stocks, and 3) maintenance of genetic variance. This policy, as described in the 2001 KBH annual management plan (McCullough and Aro 2001), will be followed in 2005 for all projects.

To protect wild stocks and maintain genetic variance unharvested adults produced from hatchery stocking projects must be prevented from straying into stream and lake systems supporting wild stocks. A management strategy targeting unharvested enhanced production is required by ADFG to insure compliance with state regulations for private nonprofit (PNP) salmon hatcheries (5AAC 40.005.(f)). This strategy must address ADF&G PNP permitting requirements for salmon straying concerns and include detailed actions required when harvest of enhanced production is delayed or abandoned.

These actions were detailed in an unplanned cost recovery operational plan (UCROP) as part of the PCH annual management plan, 2003 and included cost recovery fisheries in the THAs (currently SHAs; Honnold and Clevenger 2003). If commercial fishing does not occur for some

reason in 2005, salmon returning to the Kitoi Bay SHA will be harvested using the guidelines described in the UCROP.

POLICIES AND GUIDELINES FOR HEALTH AND DISEASE CONTROL

The State of Alaska Pathology Review Committee has developed a long range goal to prevent dissemination of infectious finfish (and shellfish) disease within or outside the borders of Alaska (McGee 1995). This goal is intended to protect stocks without constraining aquaculture or stock renewal programs. The policy and guidelines do not advocate transplanting wild finfish stocks between geographic zones in attempt to minimize risk of transporting disease from one zone to another. In addition, this policy includes hatchery stocks in order to be consistent with the Genetics policy. Some exceptions may be made on a case by case basis. The policy and guidelines for health and disease control, as described in the 2001 Kitoi Bay Hatchery AMP (McCullough and Aro 2001) will be followed in 2005 for all projects.

EVALUATION

In FY 2003 the evaluation program and all the field operation responsibilities were transferred from ADF&G to Kodiak Regional Aquaculture Association personnel. The objectives of the evaluation program have essentially remained the same and include: 1) monitoring salinity, temperature, and plankton bloom data in Kitoi Bay during saltwater rearing periods for juvenile pink, chum, and coho salmon, 2) estimating the age structure of chum salmon returning to the hatchery, 3) collecting baseline age and growth data from coho and sockeye presmolt and smolt reared at KBH, 4) estimating the number of sockeye salmon smolt outmigrating from LKL, 5) estimating the survival of the sockeye salmon presmolt stocked into LKL, 6) estimating the average age, weight, and length (AWL) composition of the sockeye salmon smolt outmigrating from LKL, and 7) estimating the zooplankton density and biomass in Little Kitoi, Upper and Lower Jennifer, and Ruth Lakes (Schrof 2002).

PINK, CHUM, AND COHO SALMON

Plankton tows will be conducted in Kitoi Bay to ascertain the timing of plankton blooms and to assess general ocean conditions prior to the release of pink and chum salmon fry. Chum salmon data (scales) will be collected throughout the run to develop a more complete and representative age class record. Age, length, and sex data will be collected from the escapement (600 adults) to Big Kitoi Creek and from the Kitoi Bay area commercial harvest (600 adults; McCullough and Aro 2002). These data will be used to assign ages to the adult chum salmon run and estimate overall survival by release year. Prior to saltwater rearing, coho salmon smolt will be sampled for weight, length, and condition data and evaluated for their ability to osmoregulate (ability to maintain proper water and electrolyte balance in saltwater). The latter assessment will include holding small numbers of juveniles in the net pens used for rearing in saltwater and recording mortality. This will be repeated until mortality is minimal (<1%). Once this occurs, the remaining smolt will be transferred to the net pens for saltwater rearing.

SOCKEYE SALMON

The sockeye salmon evaluation program will continue to focus on assessing production from LKL presmolt releases. In 2005 we will rear and imprint 280,000 presmolt in net pens in LKL and non-volitionally release them during the peak outmigration of the resident sockeye salmon smolt. This release group will have 200 random scale samples collected both prior to transfer into the net pens

and prior to non-volitional release. These presmolt should average about 25.0-g and should have significantly different scale patterns than the presmolt released into LKL in the fall. In 2005 we will also release 100,000 fall presmolts (BY 2004) into LKL at the beginning of October. These fall presmolt will also be sampled for age data prior to release. The growth patterns from these scales will provide baseline data that will be used to identify stock (release lot) of origin when adults return to LKL.

Studies on the degree of imprinting and survival of sockeye salmon to LKL were implemented in 1997 (Hall et al. 1998). These studies will continue with an evaluation of age 1. sockeye presmolt releases. All sockeye salmon observed in Big Kitoi Creek and the hatchery raceways will be examined for marks and scales, and fish lengths will be taken. Scales taken from adults without marks will be aged and the scale patterns will be compared to LKL sockeye scale patterns. Any sockeye salmon found in the hatchery raceways will be killed, to prevent straying to other systems, and donated to charities.

The assessment of the sockeye salmon stocking strategy by age and or size at release was also part of the original evaluation program in conjunction with a straying study (Hall et al. 1999; Schrof et al. 2000). The intent of these studies was to determine which stocking strategy was the most successful, in terms of adult production. In 2005 a portion of the sockeye salmon released (10% of the fall release into LKL) will again be marked prior to release by fin clipping to determine the success of a given rearing strategy. Returning adult sockeye salmon will be examined for fin clips and sampled at LKL fish ladder.

Limnology data will be collected in 2005 from Little Kitoi, Upper and Lower Jennifer, and Ruth Lakes and salinity, temperature, and plankton data will be collected from Big and Little Kitoi Bays.

ACKNOWLEDGMENTS

We acknowledge the KRAA Director, Larry Malloy and all KRAA permanent and seasonal personnel that staff Kitoi Bay Hatchery. We also acknowledge the ADF&G personnel that contributed to the management plan including Lucinda Neel for her publication expertise, Kevin Brennan, David Barnard, and Jim McCullough who provided editorial comments, and Patti Nelson, the Division of Commercial Fisheries Finfish Regional editor.

REFERENCE CITED

Barnaby, J.T. 1944. Fluctuations in abundance of red salmon *Oncorhynchus nerka* (Walbaum) in Karluk Lake, Alaska. U.S. Fish Wildlife Service Fishery Bulletin 39: 235-295. Technical Bulletin Number 154. Department of Natural Resources, Madison.

Brennan, K., D. Gretsch, and J. Wadle. 2002. Kodiak management area harvest strategy for the 2002 commercial salmon season. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K02-31, Kodiak.

Brennan, K., D. Gretsch, and J. Wadle. 2003. Kodiak management area harvest strategy for the 2003 commercial salmon season. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K03-26, Kodiak.

Brennan, K., J. Wadle, and D. Gretsch. 2004. Kodiak Management Area harvest strategy for the 2004 season commercial salmon fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K04-19, Kodiak.

REFERENCE CITED (CONT.)

Brennan, K., J. Wadle, and D. Gretsch. 2005. Kodiak Management Area harvest strategy for the 2005 season commercial salmon fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Fishery Management Report 05-329, Anchorage.

Burgner, R.L. 1964. Factors influencing production of sockeye salmon (*Oncorhynchus nerka*) in lakes of southwestern Alaska. Int. Ver. Theor. Angew. Limnol. Verh. 15:504-513.

Clevenger C., S.G. Honnold, and J.N. McCullough. 1997. Pillar Creek Hatchery annual management plan, 1997. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K97-31, Kodiak.

Foerster, R.E. 1968. The Sockeye Salmon, *Oncorhynchus nerka*. Bulletin of the Fisheries Research Board of Canada. 162:422 p.

Hall A., S.G. Honnold, and J.N. McCullough. 1997. Kitoi Bay Hatchery annual management plan, 1996. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K97-36, Kodiak.

Hall A., S.G. Honnold, and J.N. McCullough. 1998. Kitoi Bay Hatchery annual management plan, 1996. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K98-20, Kodiak.

Hall A., S.G. Honnold, J.N. McCullough, and S.T. Schrof. 1999. Kitoi Bay Hatchery annual management plan, 1999. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K99-43, Kodiak.

Honnold, S.G. 1997. The results of sockeye salmon (*Oncorhynchus nerka*) stocking into Spiridon Lake in the Kodiak National Wildlife Refuge: juvenile and adult production, commercial harvest, and ecosystem effects, 1987-1996. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K97-47, Kodiak.

Honnold, S.G. and A.W. Aro. 2003. Kitoi Bay Hatchery annual management plan, 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K03-39, Kodiak.

Honnold, S.G. and A.W. Aro. 2004. Kitoi Bay Hatchery annual management plan, 2004. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K04-29, Kodiak.

Honnold, S.G. and C. Clevenger. 2003. Pillar Creek Hatchery annual management plan, 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K03-38, Kodiak.

Honnold, S.G. and G. Byrne. *In press.* Pillar Creek Hatchery annual management plan, 2005. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report, Kodiak.

Koenings, J.P., H. Geiger, and J. Hasbrouck. 1993. Smolt-to-adult survival patterns of sockeye salmon: effects of length and latitude after entering sea. Canadian Journal of Fisheries and Aquatic Sciences 50:600-611.

Krokhin, E.M. 1957. Determination of the daily food ration of young sockeye and three-spined stickleback by the respiration method. Izvestiia TINRO, 44: 97-110. [FRB Translation No. 209].

McCullough, J.N., A.W. Aro, and S.G. Honnold. 2000. Kitoi Bay Hatchery annual management plan, 2000. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K00-43, Kodiak.

McCullough, J.N. and A.W. Aro. 2001. Kitoi Bay Hatchery annual management plan, 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K01-42, Kodiak.

McCullough, J.N. and A.W. Aro. 2002. Kitoi Bay Hatchery annual management plan, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K02-41, Kodiak.

McGee, S.G. 1995. The hatchery program and protection of wild salmon in Alaska: policies and regulations. Alaska Department of Fish and Game, Division of Commercial Fisheries, Draft Report (compilation), Juneau.

REFERENCE CITED (CONT.)

Schrof, S.T. 2002. Kitoi evaluation project operational plan, 2002. *In* Salmon research operational plans for the Kodiak area, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K02-36, Kodiak.

Schrof, S.T., S.G. Honnold, C. Hicks, and J. Wadle. 2000. A summary of salmon enhancement, rehabilitation, evaluation, and monitoring efforts conducted in the Kodiak Management Area through 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K00-57, Kodiak.

Schrof, S.T. and S.G Honnold. 2003. A summary of salmon enhancement, rehabilitation, evaluation, and monitoring efforts conducted in the Kodiak Management Area through 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K03-41, Kodiak.

TABLES AND FIGURES

Table 1.-Kitoi Bay Hatchery pink, chum, and coho salmon egg takes (Big Kitoi Creek broodstock) in 2003 and 2004, resultant juvenile releases planned for Big Kitoi Bay in 2005 and 2006, projected adult production, and fish transport permit information.

Parameter	Pink Salmon	Chum Salmon	Coho Salmon	Coho Salmon
Brood Year	2004	2004	2003	2004
Egg take				
eggs	183,322,623	25,759,400	1,197,330	1,200,000
adults	367,522	38,968	7,003	7,000
Releases				
location	Big Kitoi Bay	Big Kitoi Bay	Big Kitoi Bay	Big Kitoi Bay
number	145,000,000	22,000,000	1,000,000	1,000,000
size (g)	0.7	2.5	20.0	20.0
lifestage	fed fry	fed fry	smolt	smolt
date	20-May-05	20-May-05	31-May-05	31-May-06
Projected Returns [a]				
2006	6,597,500	0	160,000	0
2007	0	114,400	0	160,000
2008	0	660,000	0	0
2009	0	105,600	0	0
total	6,597,500	880,000	160,000	160,000
Fish Transport Permit (FTP)				
number	01A-0102	01A-0103	02A-0007	02A-0007
expires	30-Aug-06	31-Aug-06	01-May-12	01-May-12
max. no. eggs	215,000,000	25,000,000	1,300,000	1,300,000
max. no. juveniles	182,000,000 Fry	22,000,000 Fry	1,000,000 Smolt	1,000,000 Smolt

[a] Projected returns are calculated from Table 2 survival and age assumptions.

Table 2.-Salmon survival and age assumptions used to estimate returns for Kitoi Bay Hatchery.

	Stocking			Survival[a]	Age-at-return Proportions[a]										
Species	Year	Life Stage[b]	Size (g)	Stocking-to-adult return	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	0.5	2.3
Pink	even	F	0.7	4.55%	1.00										
	odd	F	0.7	5.33%											
Chum	2005	F	2.5	4.00%		0.13		0.75			0.12				
	2006	F	2.5	4.00%		0.13		0.75			0.12				
Coho	all	FG	0.7	2.00%						1.00					
Coho	all	FPS	7.5	5.00%			1.00								
Coho	all	S	20	16.00%			1.00								
Sockeye	all	FPS	9	7.50%			0.01		0.31	0.01		0.39	0.24		0.05
Sockeye	all	SPS	20	15.00%			0.02		0.55			0.44			

[a] Based on actual survival and age-at-return data from Kitoi Bay Hatchery and/or other ADF&G research projects; increased size of chum fry in 2005 expected to approximately double survival; pink survival last four even years: 4.55%, historic average for odd year survival: 5.33%

[b] F=fry, FG=fingerling, FPS= fall presmolt, S=smolt, and SPS=spring presmolt.

Table 3.-Kitoi Bay Hatchery coho salmon egg takes (Big Kitoi Creek broodstock) in 2004, resultant juvenile releases planned for Jennifer, Ruth, Crescent, and Katmai Lakes in 2005, projected adult production, and fish transport permit information.

Parameter	Coho Salmon	Coho Salmon	Coho Salmon	Coho Salmon
Brood Year	2004	2004	2004	2004
Egg take				
eggs	275,492	55,098	553,103	36,026
adults	1,611	322	3,235	211
Stocking				
location	Jennifer Lake	Ruth Lake	Crescent Lake	Katmai Lake
number	200,000	30,000	165,000	15,000
size (g)	0.7	0.7	0.7	7.5
lifestage	fingerling (FG)	fingerling (FG)	fingerling (FG)	presmolt (PS)
date	20-Jun-05	20-Jun-05	20-Jun-05	01-Oct-05
Projected Returns [a]				
2007	0	0	0	750
2008	4,000	600	3,300	0
total	4,000	600	3,300	750
Fish Transport Permit (FTP)				
number	02A-0009	02A-0011	02A-0008	02A-0010
expires	01-May-12	01-May-12	15-May-12	01-May-12
max. no. eggs	300,000	60,000	600,000	40,000
max. no. juveniles	250,000 FG	50,000 FG	500,000 FG	30,000 PS

[a] Projected returns are calculated from Table 2 survival and age assumptions.

Table 4.-Pillar Creek Hatchery sockeye salmon egg takes (Saltery Lake broodstock) - egg transfer to Kitoi Bay Hatchery in 2003 and 2004, resultant juvenile releases planned for Little Kitoi Lake in 2005 and 2006, projected adult production, and fish transport permit information.

Parameter	Sockeye Salmon	Sockeye Salmon	Sockeye Salmon
Brood Year	2003	2004	2004
Egg take			
eggs	424,224	102,407	412,397
adults	240	80	320
Stocking			
location	Little Kitoi Lake	Little Kitoi Lake	Little Kitoi Lake
number	280,000	100,000	400,000
size (g)	25.00	9.00	25.00
lifestage	presmolt	presmolt	presmolt
date	27-May-05	01-Oct-05	27-May-06
Projected Returns [a]			
2006	672	0	0
2007	22,890	38	960
2008	18,438	2,385	32,700
2009	0	4,665	26,340
2010	0	405	0
total	42,000	7,493	60,000
Fish Transport Permit (FTP)			
number [b]	02A-0060	02A-0060	05A-0078
expires	01-Feb-05	01-Feb-05	12-Jun-10
max. no.	300,000	100,000	500,000
lifestage	Presmolt	Presmolt	Presmolt

[a] Projected returns are calculated from Table 2 survival and age assumptions.

[b] FTP 97A-0068 - for 1.2 million green eggs, expiring 31Dec-08, authorizes egg take for these projects; FTP 02A-0060 was amended in 2004 to provide for presmolt releases off 300,000 in 2005. Currently, FTP 05A-0078 has been submitted to provide for the 2006 spring presmolt releases.

Table 5.-Forecasted runs, broodstock requirements, minimum escapements, and projected harvest of salmon returning to systems in 2005 as a result of prior Kitoi Bay Hatchery stockings (rounded to thousands).

		Forecasted Run			Broodstock	Minimum	Projected
Return Location	Species	Low	Point	High	Required	Escapement	Harvest[a]
Kitoi Bay Hatchery	Pink	8,218,000	10,576,000	12,026,000	335,000	15,000 [b]	10,226,000
	Chum	197,000	278,000	339,000	30,000	2,000 [b]	246,000
	Coho	141,000	158,000	187,000	6,000	0	152,000
Little Kitoi Lake	Sockeye[c]	6,000	9,000	12,000	8,000	0	1,000
	Coho		500		0	500	0
Crescent Lake	Coho	2,000	3,000	4,000	0	0	3,000
Katmai Creek	Coho		1,000		0	0	1,000
Saltery Lake[d]	Sockeye				4,000	15,000	

[a] Point estimate of forecasted run minus broodstock and escapement needs.

[b] Minimum escapement for Big Kitoi Creek refers to adults remaining in the creek after the hatchery has completed the egg-takes.

[c] Egg take may occur in 2004 if sufficient adults (Saltery Lake broodstock) are counted through the fish pass into the lake. Eggs may be transferred to Pillar Creek Hatchery for stocking of Spiridon Lake in 2006. Broodstock numbers include 3,444 for Pillar Creek Hatchery and 672 for Kitoi Bay Hatchery for continued broodstock development (Little Kitoi Lake stocking). Assumption is that only 50% of Little Kitoi Lake escapement can be captured for broodstock (based on past seining efforts).

[d] Saltery Lake egg take will occur if insufficient adults are available for a Little Kitoi egg take.

Table 6.-Proposed 2005 Kitoi Bay Hatchery pink, chum, and coho salmon (including 2004) egg takes (Big Kitoi Creek broodstock), resultant juvenile releases planned for Big Kitoi Bay in 2006 and 2007, projected adult production, and fish transport permit information.

Parameter	Pink Salmon	Chum Salmon	Coho Salmon	Coho Salmon
Brood Year	2005	2005	2004	2005
Egg take				
eggs	175,000,000	25,000,000	1,300,000	1,300,000
adults	335,000	30,000	3,360	3,360
Releases				
location	Big Kitoi Bay	Big Kitoi Bay	Big Kitoi Bay	Big Kitoi Bay
number	145,000,000	22,000,000	1,000,000	1,000,000
size (g)	0.7	2.5	20.0	20.0
lifestage	fed fry	fed fry	smolt	smolt
date	20-May-06	20-May-06	31-May-06	31-May-07
Projected Returns [a]				
2007	7,728,500	0	160,000	0
2008	0	114,400	0	160,000
2009	0	660,000	0	0
2010	0	105,600	0	0
total	7,728,500	880,000	160,000	160,000
Fish Transport Permit (FTP)				
number	01A-0102	01A-0103	02A-0007	02A-0007
expires	30-Aug-06	31-Aug-06	01-May-12	01-May-12
max. no. eggs	215,000,000	25,000,000	1,300,000	1,300,000
max. no. juveniles	182,000,000 Fry	22,000,000 Fry	1,000,000 Smolt	1,000,000 Smolt

[a] Projected returns are actual calculations using Table 2 survival and age assumptions.

Table 7.-Proposed 2005 Kitoi Bay Hatchery coho salmon egg takes (Big Kitoi Creek broodstock), resultant juvenile releases planned for Jennifer, Ruth, Crescent, and Katmai Lakes in 2006, projected adult production, and fish transport permit information.

Parameter	Coho Salmon	Coho Salmon	Coho Salmon	Coho Salmon
Brood Year	2005	2005	2005	2005
Egg take				
eggs	300,000	60,000	600,000	40,000
adults	780	180	1,560	120
Stocking				
location	Jennifer Lake	Ruth Lake	Crescent Lake	Katmai Lake
number	200,000	30,000	165,000	15,000
size (g)	0.7	0.7	0.7	7.5
lifestage	fingerling (FG)	fingerling (FG)	fingerling (FG)	presmolt (PS)
date	20-Jun-06	20-Jun-06	20-Jun-06	01-Oct-06
Projected Returns [a]				
2008	0	0	0	750
2009	4,000	600	3,300	0
total	4,000	600	3,300	750
Fish Transport Permit (FTP)				
number	02A-0009	02A-0011	02A-0008	02A-0010
expires	01-May-12	01-May-12	15-May-12	01-May-12
max. no. eggs	300,000	60,000	600,000	40,000
max. no. juveniles	250,000 FG	50,000 FG	500,000 FG	30,000 PS

[a] Projected returns are calculated from Table 2 survival and age assumptions.

Table 8.-Proposed Pillar Creek Hatchery sockeye salmon egg takes (Saltery Lake broodstock) - egg transfer to Kitoi Bay Hatchery in 2004 and 2005, resultant juvenile releases planned for Little Kitoi Lake in 2006 and 2007, projected adult production, and fish transport permit information.

Parameter	Sockeye Salmon	Sockeye Salmon	Sockeye Salmon
Brood Year	2004	2005	2005
Egg take			
eggs	412,397	120,000	480,000
adults	320	96	576
Stocking			
location	Little Kitoi Lake	Little Kitoi Lake	Little Kitoi Lake
number	400,000	100,000	400,000
size (g)	25.00	9.00	25.00
lifestage	presmolt	presmolt	presmolt
date	27-May-06	01-Oct-06	27-May-07
Projected Returns [a]			
2007	960	0	0
2008	32,700	38	960
2009	26,340	2,385	32,700
2010	0	4,665	26,340
2011	0	405	0
total	60,000	7,493	60,000
Fish Transport Permit (FTP) [b]			
number	05A-0078	05A-0078	05A-0078
expires	12-Jun-10	12-Jun-10	12-Jun-10
max. no.	500,000	500,000	500,000
lifestage	Presmolt	Presmolt	Presmolt

[a] Projected returns are calculated from Table 2 survival and age assumptions.

[b] FTP 97A-0068 - for 1.2 million green eggs, expiring 31Dec-08, authorizes egg take for these projects.

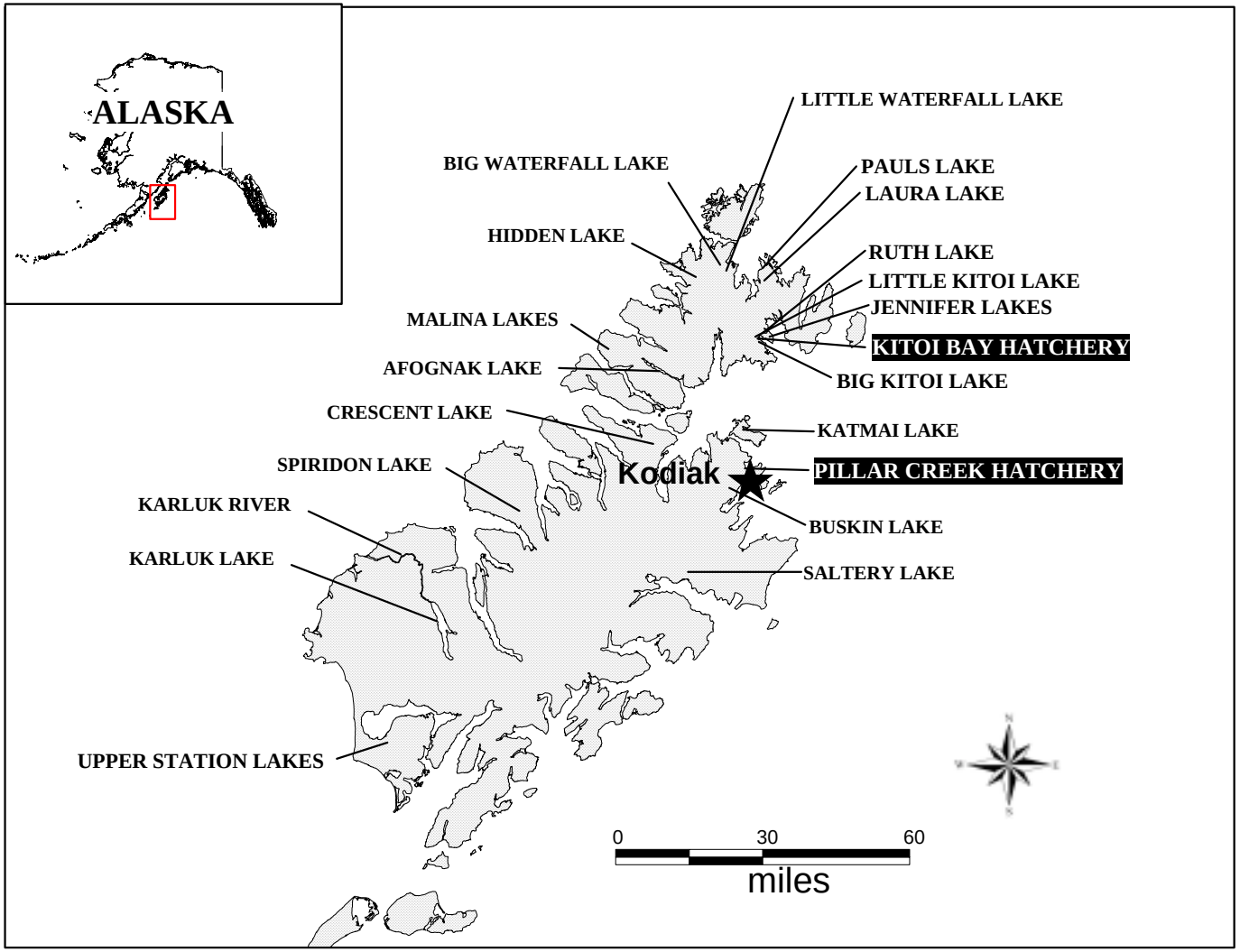

Figure 1.-Locations of sockeye salmon enhancement and rehabilitation projects on Kodiak and Afognak Islands, 2005.

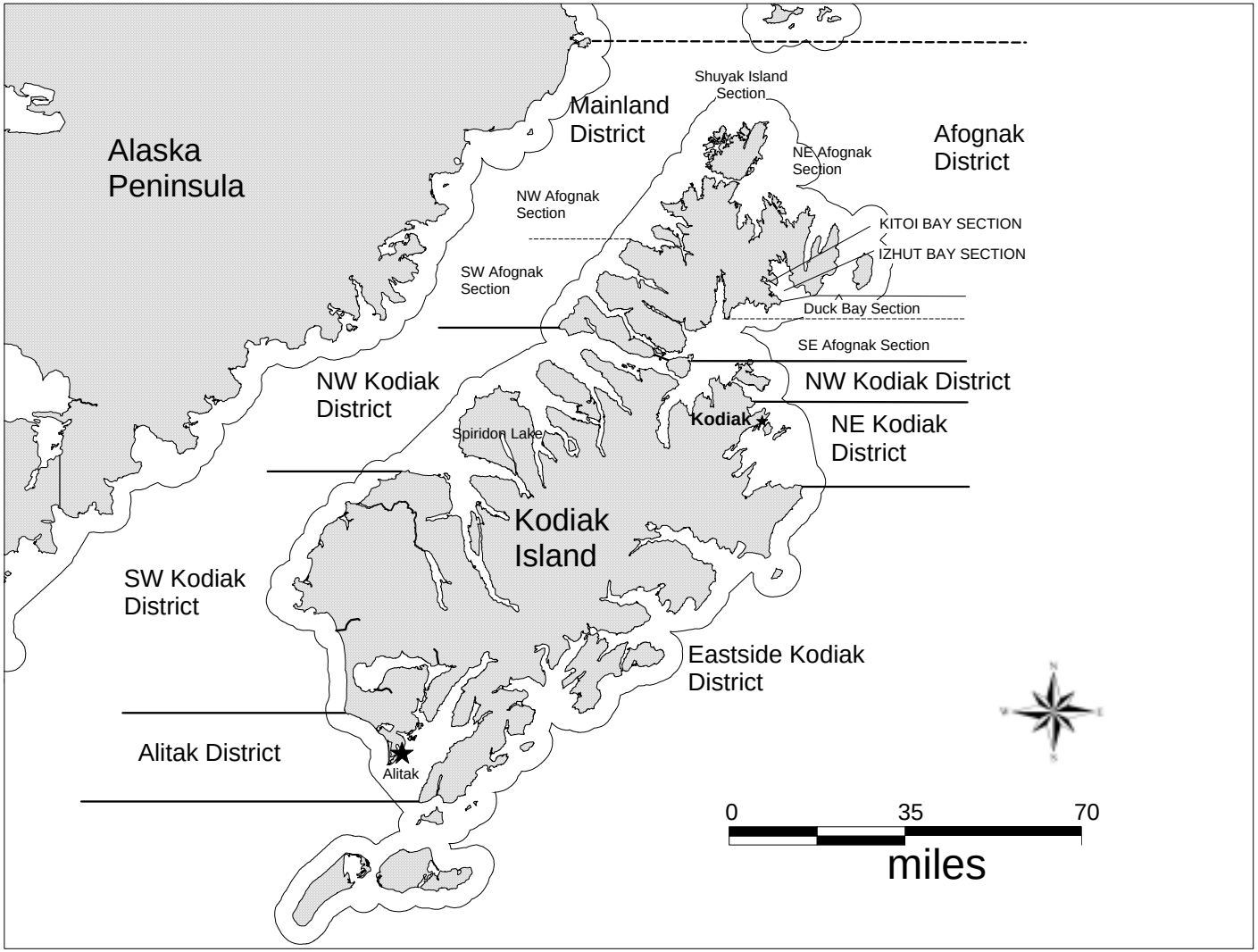

Figure 2.-Map of the Kodiak Management Area depicting commercial fishing districts and selected sections.

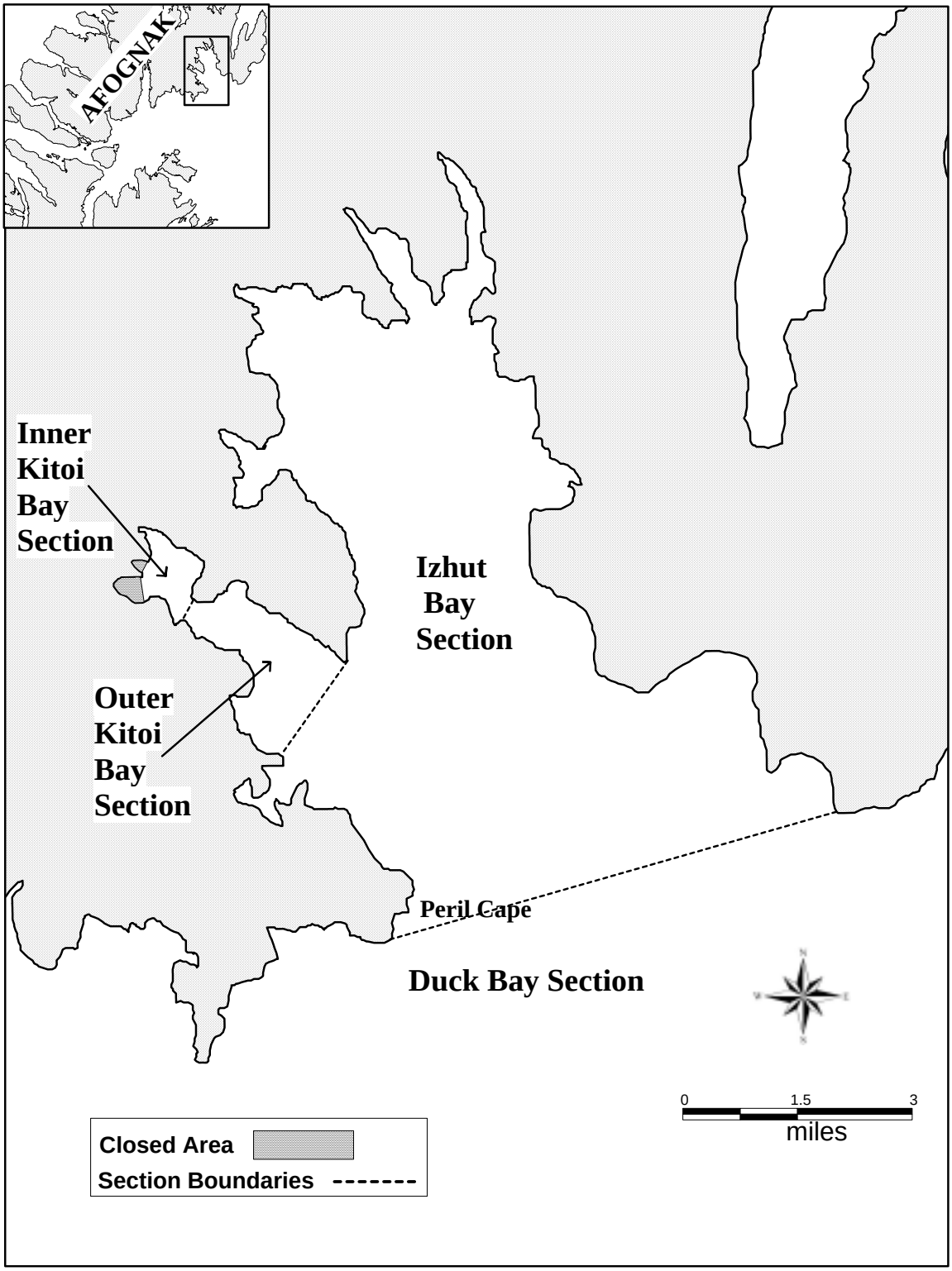

Figure 3.-Map of Izhut (252-30), Duck (252-31), and Inner and Outer Kitoi Bay (252-32) Sections.

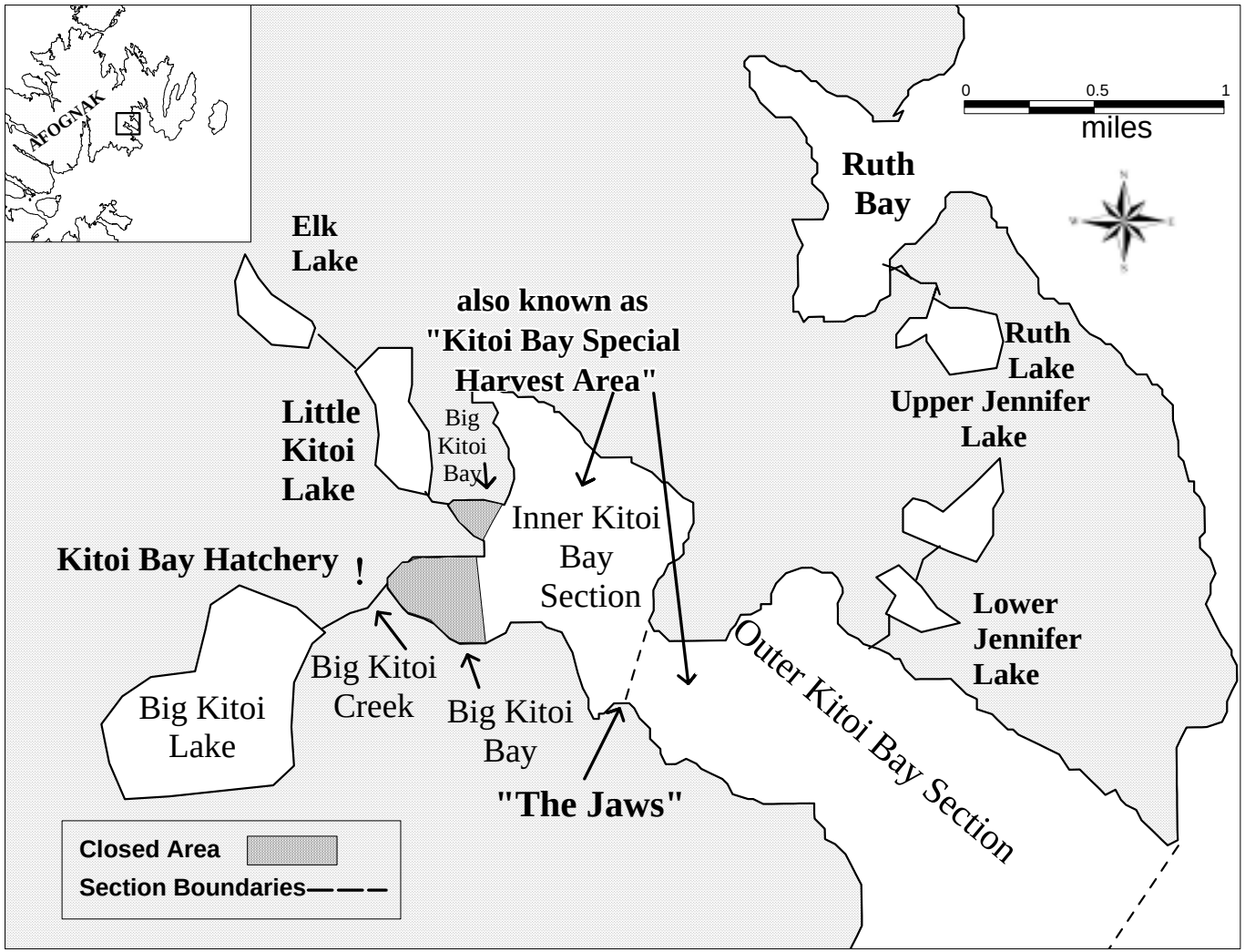

Figure 4.-Map of Inner and Outer Kitoi Bay Sections (252-32).

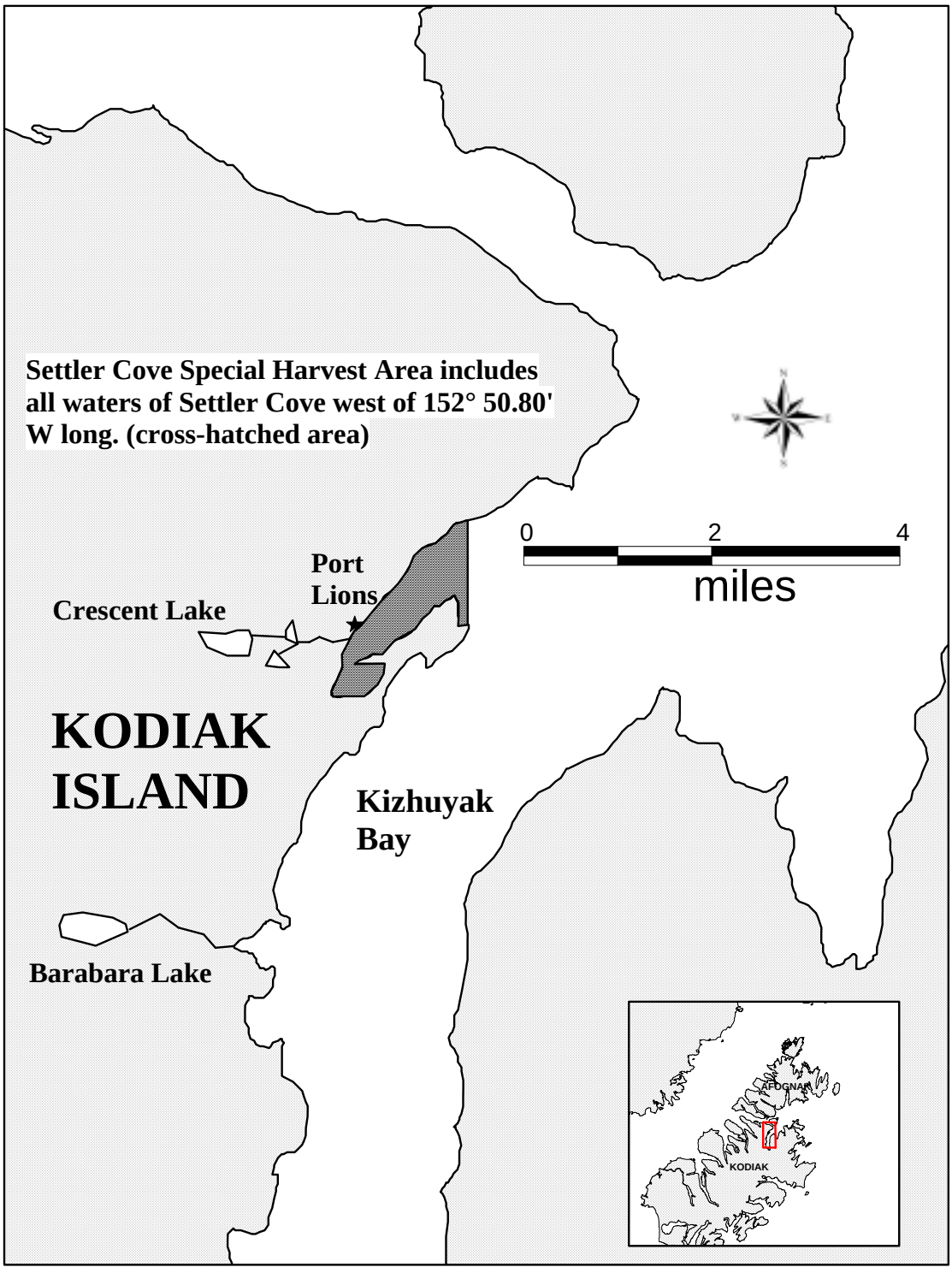

Figure 5.-Settler Cove (Crescent Lake) special harvest area boundaries in Kizhuyak Bay.

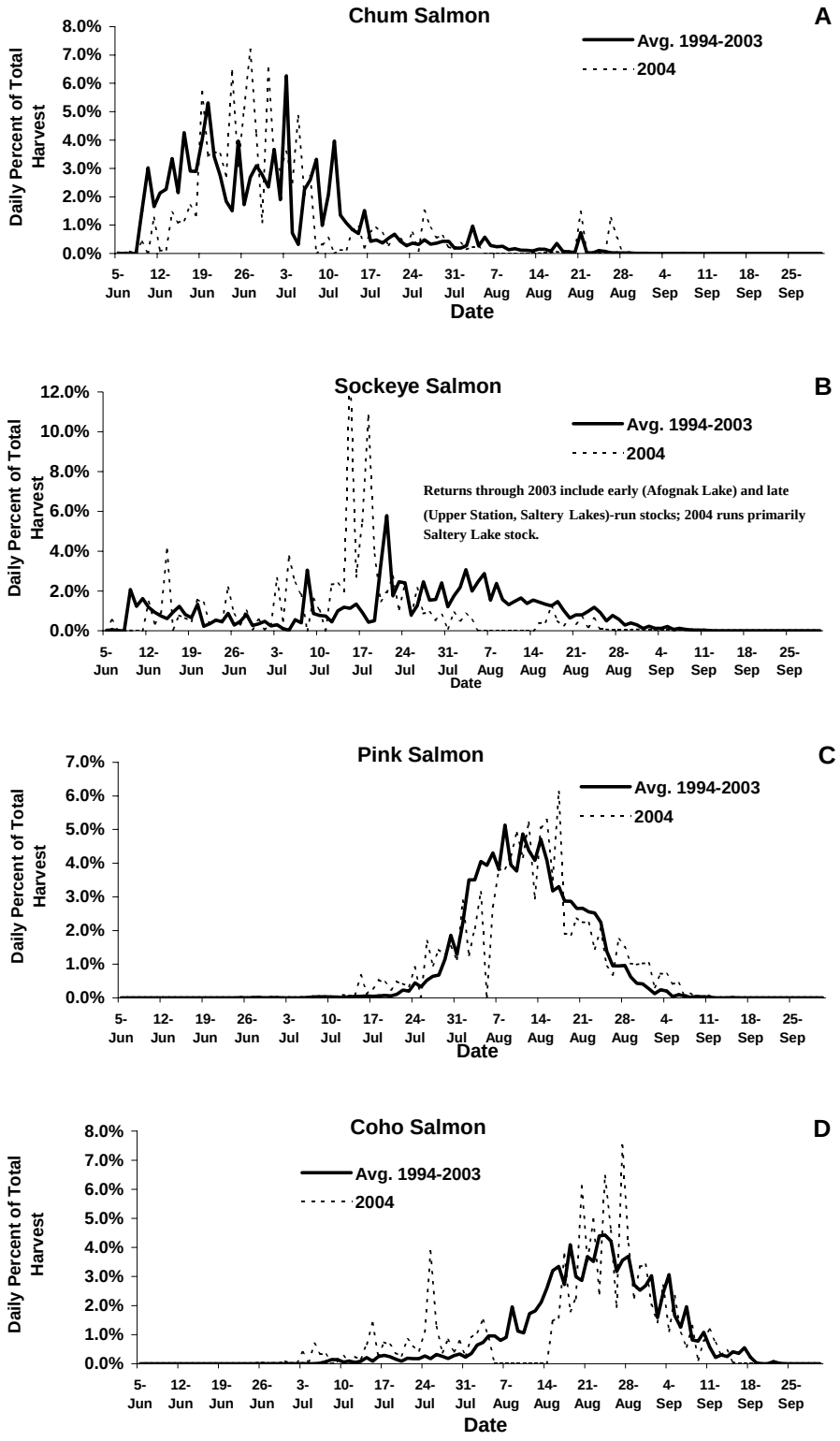

Figure 6.-The average (1994-2003) timing compared to the 2004 timing of the harvests of chum (A), sockeye (B), pink (C), and coho (D) salmon in the Kitoi Bay area (combined harvests in the Izhut, Duck, and Kitoi Bay Sections).

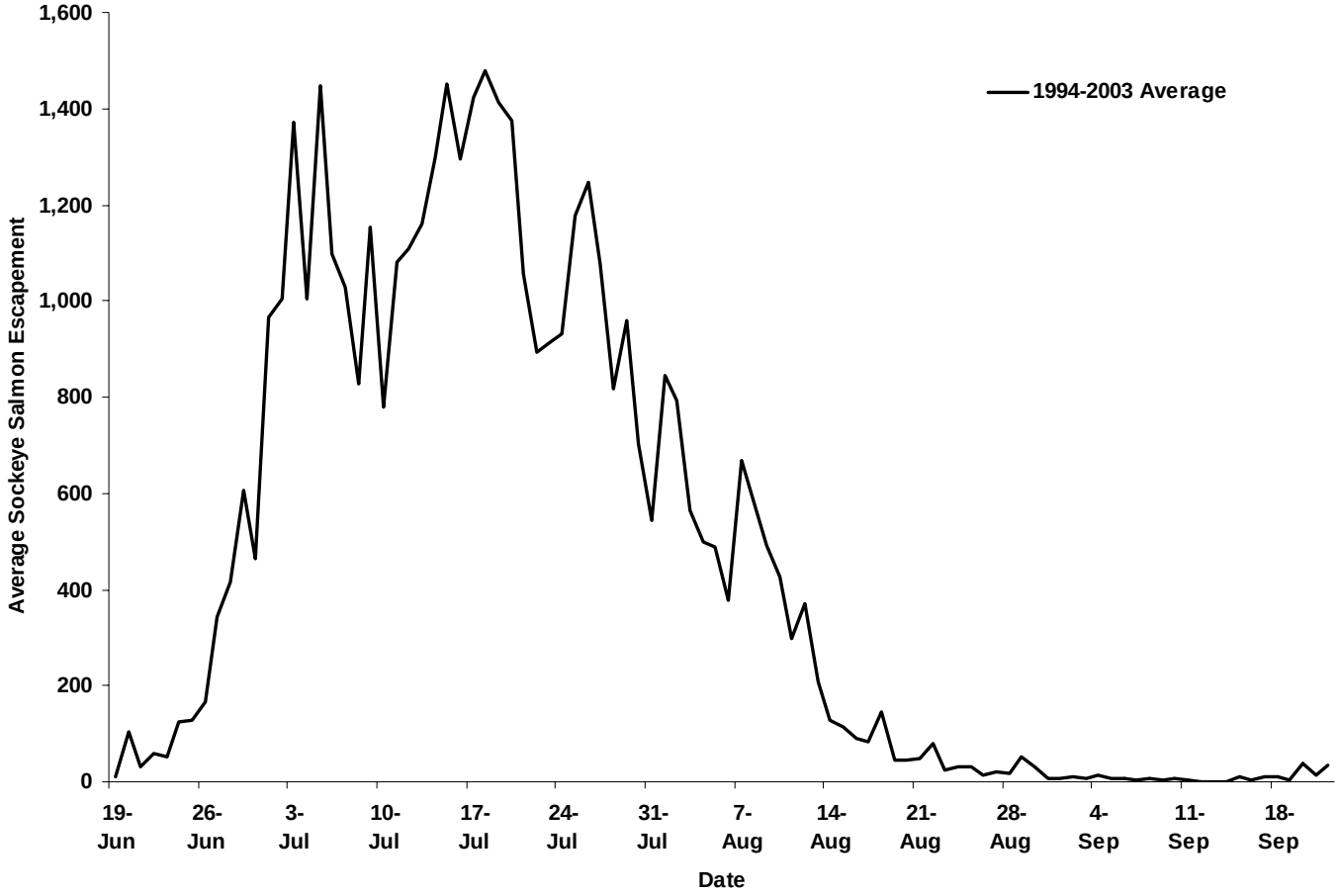

Figure 7.-Saltery Lake sockeye salmon average escapement timing, 1994-2003 (weir was not operated in 2004).

APPENDIX A. KITOI BAY HATCHERY HISTORICAL JUVENILE SALMON RELEASES

Appendix A1.-Kitoi Bay Hatchery pink salmon release history, 1973-2004.

Brood Year	Pink Salmon Releases[a]		
	Year	Number	Avg. Weight (g)
1972	1973	493,130	
1973	1974	447,642	
1974	1975	1,226,314	
1975	1976	2,486,410	
1976	1977	4,722,152	0.50
1977	1978	17,255,424	0.44
1978	1979	17,319,537	
1979	1980	22,458,947	0.63
1980	1981	26,351,664	0.93
1981	1982	47,828,701	
1982	1983	72,054,096	0.79
1983	1984	87,065,569	0.58
1984	1985	75,109,442	0.29
1985	1986	97,773,052	0.78
1986	1987	90,017,823	0.27
1987	1988	94,172,516	0.73
1988	1989	80,502,220	0.62
1989	1990	84,907,550	0.61
1990	1991	124,148,019	0.60
1991	1992	147,145,130	0.80
1992	1993	169,552,112	0.51
1993	1994	163,192,575	0.45
1994	1995	134,104,406	0.53
1995	1996	144,045,245	0.48
1996	1997	102,583,724	0.50
1997	1998	128,101,460	0.50
1998	1999	127,685,500	0.54
1999	2000	137,702,154	0.61
2000	2001	134,823,670	0.72
2001	2002	152,990,900	0.56
2002	2003	144,823,895	0.86
2003	2004	154,073,358	0.76

[a] Big Kitoi Creek broodstock; juveniles (fry lifestage) were released into Big Kitoi Bay net pens for rearing, then released into Big Kitoi Bay.

Appendix A2.-Kitoi Bay Hatchery chum salmon release history, 1982-2004.

Brood	Chum Salmon Releases[a]		
Year	Year	Number	Avg. Weight (g)
1981	1982	36,846	0.56
1982	1983	105,058	1.05
1983	1984	630,422	1.16
1984	1985	784,078	0.67
1985	1986	414,233	
1986	1987	693,166	2.00
1987	1988	4,737,587	2.10
1988	1989	3,289,878	1.85
1989	1990	1,502,501	2.44
1990	1991	0	
1991	1992	22,214,472	1.80
1992	1993	10,101,986	2.02
1993	1994	6,507,497	1.52
1994	1995	9,738,472	1.51
1995	1996	20,139,843	1.27
1996	1997	23,500,000	1.50
1997	1998	12,310,015	1.50
1998	1999	6,859,982	1.02
1999	2000	22,334,640	1.70
2000	2001	20,032,140	1.73
2001	2002	19,593,070	1.55
2002	2003	18,721,700	1.66
2003	2004	21,778,050	2.01

[a] Big Kitoi Creek broodstock released into Big Kitoi Bay.

Appendix A3.-Kitoi Bay Hatchery coho salmon release history by location (active projects), 1983-2004.

Brood Year	Brood Stock	Coho Salmon Releases				
		Year	Number	Avg. Weight (g)	Life stage	Location
1986	Little Kitoi Lake	1987	9,600	5.00	Presmolt	Big Kitoi Creek
1988	Little Kitoi Lake	1990	137,493	23.30	Smolt	Big Kitoi Bay
1990	Little Kitoi Lake	1992	60,755	32.00	Smolt	Big Kitoi Bay
1991	Little Kitoi Lake	1993	613,681	18.90	Smolt	Big Kitoi Bay
1992	Little Kitoi Lake	1993	5,163	14.60	Presmolt	Big Kitoi Creek
1992	Little Kitoi Lake	1994	97,973	28.40	Smolt	Big Kitoi Bay
1993	Big Kitoi Creek	1995	258,926	25.90	Smolt	Big Kitoi Bay
1994	Big Kitoi Creek	1996	894,486	23.54	Smolt	Big Kitoi Bay
1995	Big Kitoi Creek	1997	819,046	19.57	Smolt	Big Kitoi Bay
1996	Big Kitoi Creek	1998	769,000	23.90	Smolt	Big Kitoi Bay
1997	Big Kitoi Creek	1999	1,098,338	19.30	Smolt	Big Kitoi Bay
1998	Big Kitoi Creek	2000	871,448	16.92	Smolt	Big Kitoi Bay
1999	Big Kitoi Creek	2001	936,913	20.76	Smolt	Big Kitoi Bay
2000	Big Kitoi Creek	2002	1,041,342	16.90	Smolt	Big Kitoi Bay
2001	Big Kitoi Creek	2003	1,064,864	16.75	Smolt	Big Kitoi Bay
2002	Big Kitoi Creek	2004	969,483	20.08	Smolt	Big Kitoi Bay
1987	Little Kitoi Lake	1988	241,373	1.13	Fingerling	Crescent Lake
1988	Little Kitoi Lake	1989	202,955	0.82	Fingerling	Crescent Lake
1990	Little Kitoi Lake	1991	191,416	1.10	Fingerling	Crescent Lake
1991	Little Kitoi Lake	1992	69,100	7.04	Presmolt	Crescent Lake
1992	Little Kitoi Lake	1993	68,420	14.60	Presmolt	Crescent Lake
1993	Big Kitoi Creek	1994	163,680	0.98	Fingerling	Crescent Lake
1994	Big Kitoi Creek	1995	167,778	1.16	Fingerling	Crescent Lake
1995	Big Kitoi Creek	1996	163,200	0.40	Fry	Crescent Lake
1996	Big Kitoi Creek	1997	165,000	0.35	Fry	Crescent Lake
1997	Big Kitoi Creek	1998	163,000	0.60	Fry	Crescent Lake
1998	Big Kitoi Creek	1999	165,000	0.57	Fry	Crescent Lake
1999	Big Kitoi Creek	2000	165,837	0.42	Fry	Crescent Lake
2000	Big Kitoi Creek	2001	165,000	0.90	Fry	Crescent Lake
2001	Big Kitoi Creek	2002	164,487	0.65	Fry	Crescent Lake
2002	Big Kitoi Creek	2003	164,395	0.63	Fry	Crescent Lake
2003	Big Kitoi Creek	2004	165,000	0.76	Fry	Crescent Lake
1991	Little Kitoi Lake	1992	162,387	4.50	Fingerling	Jennifer Lakes
1992	Little Kitoi Lake	1993	135,486	1.94	Fingerling	Jennifer Lakes
1994	Big Kitoi Creek	1995	165,000	1.46	Fingerling	Jennifer Lakes
1996	Big Kitoi Creek	1997	163,000	0.35	Fry	Jennifer Lakes
1997	Big Kitoi Creek	1998	165,000	0.50	Fry	Jennifer Lakes
1998	Big Kitoi Creek	1999	136,000	0.55	Fry	Jennifer Lakes
1999	Big Kitoi Creek	2000	155,688	0.44	Fry	Jennifer Lakes

-continued-

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Brood Year	Brood Stock	Coho Salmon Releases				
		Year	Number	Avg. Weight (g)	Life stage	Location
2000	Big Kitoi Creek	2001	120,000	0.86	Fry	Jennifer Lakes
2001	Big Kitoi Creek	2002	201,320	0.57	Fry	Jennifer Lakes
2002	Big Kitoi Creek	2003	197,590	0.57	Fry	Jennifer Lakes
2003	Big Kitoi Creek	2004	200,000	0.76	Fry	Jennifer Lakes
1986	Little Kitoi Lake	1987	22,349	0.50	Fingerling	Katmai Creek
1987	Little Kitoi Lake	1988	20,000	0.70	Fingerling	Katmai Creek
1991	Little Kitoi Lake	1992	14,973	8.00	Presmolt	Katmai Lake
1992	Little Kitoi Lake	1993	15,052	14.60	Presmolt	Katmai Lake
1993	Big Kitoi Creek	1994	13,178	23.28	Presmolt	Katmai Lake
1994	Big Kitoi Creek	1995	16,489	5.87	Presmolt	Katmai Lake
1995	Big Kitoi Creek	1996	15,246	5.04	Presmolt	Katmai Lake
1996	Big Kitoi Creek	1997	15,735	7.33	Presmolt	Katmai Lake
1998	Big Kitoi Creek	1999	15,000	8.23	Presmolt	Katmai Lake
1999	Big Kitoi Creek	2000	15,000	7.40	Presmolt	Katmai Lake
2000	Big Kitoi Creek	2001	15,000	8.37	Presmolt	Katmai Lake
2001	Big Kitoi Creek	2002	15,000	6.23	Presmolt	Katmai Lake
2002	Big Kitoi Creek	2003	15,000	7.38	Presmolt	Katmai Lake
2003	Big Kitoi Creek	2004	15,000	7.02	Presmolt	Katmai Lake
1994	Big Kitoi Creek	1995	59,500	1.74	Fingerling	Ruth Lake
1996	Big Kitoi Creek	1997	35,000	0.35	Fry	Ruth Lake
1997	Big Kitoi Creek	1998	35,000	0.50	Fry	Ruth Lake
1998	Big Kitoi Creek	1999	35,000	0.57	Fry	Ruth Lake
1999	Big Kitoi Creek	2000	30,695	0.72	Fry	Ruth Lake
2001	Big Kitoi Creek	2002	30,000	0.69	Fry	Ruth Lake
2002	Big Kitoi Creek	2003	30,000	0.63	Fry	Ruth Lake
2003	Big Kitoi Creek	2004	30,000	0.76	Fry	Ruth Lake

Appendix A4.-Kitoi Bay Hatchery coho salmon release history by location (non-active), 1983-1995.

Brood Year	Brood Stock	Coho Salmon Releases				
		Year	Number	Avg. Weight (g)	Life stage	Locationa
1982	Buskin	1983	77,348	0.85	Fingerling	Buskin Lake
1983	Buskin	1984	43,288	0.64	Fingerling	Buskin Lake
1984	Buskin	1985	45,645	1.88	Fingerling	Buskin Lake
1985	Buskin	1986	50,024	0.79	Fingerling	Buskin Lake
1994	Big Kitoi Creek	1995	59,030	2.50	Fingerling	Elk Lake
1994	Big Kitoi Creek	1995	28,350	2.41	Fingerling	Finger Lake
1987	Little Kitoi Lake	1988	137,585	1.13	Fingerling	Hidden Lake
1988	Little Kitoi Lake	1989	239,817	0.85	Fingerling	Hidden Lake
1990	Little Kitoi Lake	1991	250,889	1.25	Fingerling	Hidden Lake
1983	Little Kitoi Lake	1984	131,825	0.96	Fingerling	Kodiak Road System
1984	Little Kitoi Lake	1985	109,568	0.90	Fingerling	Kodiak Road System
1984	Little Kitoi Lake	1985	12,731	2.60	Fingerling	Kodiak Road System
1985	Little Kitoi Lake	1986	141,750	1.08	Fingerling	Kodiak Road System
1986	Little Kitoi Lake	1987	103,824	1.03	Fingerling	Kodiak Road System
1987	Little Kitoi Lake	1988	84,600	1.18	Fingerling	Kodiak Road System
1988	Little Kitoi Lake	1989	87,585	0.80	Fingerling	Kodiak Road System
1989	Little Kitoi Lake	1990	36,040	1.75	Fingerling	Kodiak Road System
1990	Little Kitoi Lake	1991	83,530	1.24	Fingerling	Kodiak Road System
1991	Little Kitoi Lake	1992	51,500	1.60	Fingerling	Kodiak Road System
1991	Little Kitoi Lake	1992	15,200	8.00	Presmolt	Kodiak Road System
1992	Little Kitoi Lake	1993	64,000	1.76	Fingerling	Kodiak Road System
1983	Little Kitoi Lake	1984	127,700	1.00	Fingerling	Little Kitoi Lake
1984	Little Kitoi Lake	1985	33,472	1.50	Fingerling	Little Kitoi Lake
1985	Little Kitoi Lake	1986	53,360	6.10	Presmolt	Little Kitoi Lake
1986	Little Kitoi Lake	1987	171,103	1.79	Fingerling	Little Kitoi Lake
1987	Little Kitoi Lake	1988	43,807	1.52	Fingerling	Little Kitoi Lake
1991	Little Kitoi Lake	1992	70,605	1.40	Fingerling	Little Kitoi Lake
1992	Little Kitoi Lake	1993	139,147	1.30	Fingerling	Little Kitoi Lake
1983	Little Kitoi Lake	1984	5,000	2.54	Fingerling	Shemya

[a] Kodiak Road System refers to lakes adjacent to maintained roads accessible from the City of Kodiak.

Appendix A5.-Kitoi Bay Hatchery sockeye salmon release history, 1989-2004.

Brood		Sockeye Salmon Releases				
Year	Brood Stock	Year	Number	Size (g)	Life stage	Location
1988	Upper Station	1989	143,725	2.48	Zero Check Smolt	Little Kitoi Bay
1989	Upper Station	1990	249,346	0.20	Fry	Spiridon
		1990	241,000	0.50	Fingerling	Little Kitoi Lake
		1990	337,932	0.18	Fry	Little Kitoi Lake
		1990	854,610	3.23	Zero Check Smolt	Little Kitoi Bay
		1990	458,118	0.48	Zero Check Fingerling	Little Kitoi Bay
1990	Upper Station	1991	1,250,000	2.50	Zero Check Smolt	Little Kitoi Bay
1991	Upper Station	1992	1,463,000	1.60	Zero Check Smolt	Little Kitoi Bay
1992	Upper Station	1993	52,418	3.13	Presmolt	Little Kitoi Lake
		1993	180,000	0.50	Fingerling	Jennifer Lakes
		1994	326,500	15.00	Smolt	Little Kitoi Bay
1993	Upper Station	1994	1,672,710	1.11	Zero Check Smolt	Little Kitoi Bay
	Little Kitoi Lake	1994	10,108	4.60	Presmolt	Little Kitoi Lake
		1995	916,677	10.08	Smolt	Little Kitoi Bay
1994	Upper Station	1995	266,952	1.83	Zero Check Smolt	Little Kitoi Lake
	Little Kitoi Lake	1995	84,861	4.98	Presmolt	Little Kitoi Lake
		1996	573,242	12.70	Smolt	Little Kitoi Bay
1995	Little Kitoi Lake	1996	155,687	3.16	Presmolt	Little Kitoi Lake
	Upper Station	1997	587,435	12.10	Smolt	Little Kitoi Bay
1996	Little Kitoi Lake	1997	77,039	3.31	Presmolt	Little Kitoi Lake
	Little Kitoi Lake	1997	99,085	11.70	Presmolt	Little Kitoi Lake
	Little Kitoi Lake	1998	397,000	15.10	Smolt	Little Kitoi Bay
1997	Saltery Lake	1999	106,658	17.70	Smolt	Little Kitoi Lake
1998	Saltery Lake	1999	98,737	7.00	Fingerling	Little Kitoi Lake
		2000	74,463	14.63	Presmolt	Little Kitoi Lake
		2000	23,756	14.35	Presmolt	Little Kitoi Bay[a]
1999	Saltery Lake	2000	154,039	11.31	Presmolt	Little Kitoi Lake
2000	Saltery Lake	2001	282,089	9.53	Presmolt	Little Kitoi Lake
2001	Saltery Lake	2002	212,418	6.55	Presmolt	Little Kitoi Lake
2002	Saltery Lake	2003	102,822	8.75	Presmolt	Little Kitoi Lake
2002	Saltery Lake	2004	193,646	25.68	Presmolt [b]	Little Kitoi Lake
2003	Saltery Lake	2004	20,664	9.4	Presmolt	Little Kitoi Lake

[a] This release resulted from a dissolved oxygen crash in the transfer tank.

[b] Non-volitional release, after short-term net pen rearing.

SIGN-OFF

Laurence M Malloy for Andrew Aro — 06.06.05

Andrew Aro: Kitoi Bay Hatchery Manager, KRAA — Date

Steve Honnold — 6/4/05

Steve Honnold: Regional Resource Development Biologist, CFD — Date

[signature] for — 3 Jun 05

Jim McCullough: Regional Finfish Management Supervisor, CFD — Date

Patti Nelson — 6/1/05

Patti Nelson: Regional Finfish Research Supervisor, CFD — Date

[signature] — 6-1-05

Kevin Brennan: Area Finfish Management Biologist, CFD — Date

[signature] — 3 June 05

Denby Lloyd: Regional Supervisor, CFD — Date

Ken Schwarz — 6/3/05

Len Schwarz: Area Biologist, SFD — Date

Ken Schwarz for Barry Stratton

Barry Stratton: Regional Supervisor, SFD — Date

Laurence M Malloy — 06.06.05

Larry Malloy: Executive Director, KRAA — Date

The 2005 Hatchery Management Plan for KBH is hereby approved:

for D Bedford Deputy Commissioner — 6/15/05

for McKie Campbell: Commissioner, ADF&G — Date